

Restricted

Document No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01 Date : 30th Jul 2021

***Procurement Technical Specification
of
Hydraulic Crane
for
BEML Heavy Recovery Vehicle 8 x 8***



BEML LTD

Ministry of Defence (Govt. of India Undertaking)
R&D (Defence), Unity Buildings, JC Road
Bangalore - 560 002, Karnataka, India.

***Procurement Technical Specification
of
Hydraulic Crane
for
BEML Heavy Recovery Vehicle 8 x 8***

	Prepared By	Checked By	Reviewed by	Approved By
Name	RAGHURAM K	NARASIMHA PRASAD N	SHIV KUMAR V APPA	SUNDAR RAJ K
Designation	Manager	AGM	DGM	GM

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

Revision Details

Rev. No.	Page	Details	Date

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

CONTENTS

Sl. No.	DESCRIPTION	PAGE NO.
1	INTRODUCTION	06
2	HRV 8x8 VEHICLE SYSTEM DESCRIPTIONS:	06
3	TECHNICAL SPECIFICATION OF BEML HRV 8X8 VEHICLE	07
3.1	TECHNICAL SPECIFICATIONS OF BASE VEHICLE (FOR INFORMATION)	07
3.2	TECHNICAL SPECIFICATIONS OF HYDRAULIC CRANE ASSY.	09
3.2.1	PARAMETERS OF HYDRAULIC CRANE ASSY.	09
3.2.2	RECOVERY ACCESSORIES RELATED TO HYDRAULIC CRANE ASSY.	12
3.2.3	OTHER FEATURES OF HYDRAULIC CRANE ASSY.	12
3.2.4	ADDITIONAL REQUIREMENTS OF HYDRAULIC CRANE ASSY.	14
3.2.5	QUALITY	15
4	SCOPE OF WORK	16
4.1	APPLICATION ENGINEERING	16
4.2	DEVELOPMENT, TESTING AND SUPPLY-	19
4.3	TESTING [Factory Acceptance tests (FAT)]	19
5	SUPPLY	21
5.1	STORAGE, PACKING CRATING AND MARKING	21
5.2	DELIVERABLES	21
5.3	COMMISSIONING AND FACTORY TRIALS	27

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

Sl. No.	DESCRIPTION	PAGE NO.
6	TRAINING	28
7	OTHER TERMS AND CONDITIONS	29
7.1	WARRANTY	29
7.2	MATERIALS AND WORKMANSHIP	30
7.3	PRODUCT SUPPORT	30
9	INDIGENISATION	30
	APPENDIX A	31

Note: This document is restricted proprietary document not to be shared to any firm or organization without prior permission from BEML LTD.

1 INTRODUCTION

BEML Heavy Recovery Vehicle (HRV - 8x8)

Heavy Recovery Vehicle - HRV is a truck based 8x8 vehicle on which recovery aggregates have been mounted.

The fundamental role of a Heavy Recovery Vehicle (HRV) is to recover disabled in-service vehicles and take them to a place, where they can be repaired and replenished to make it ready for operation again. Each individual Military wheeled vehicles are important asset and keeping it fit at the right location is a major logistic effort.

- i. Un-ditching, up-righting , extricating and pulling of vehicle casualties.
- ii. Rigid and suspended towing of a wheeled vehicle casualty.
- iii. Lifting major unit assemblies of equipment.
- iv. Operate as mobile crane for general use.
- v. Self Recovery.

Heavy Recovery Vehicle (HRV) is being designed and developed by BEML Limited to meet operational performance characteristics and carry out recovery operations and perform other intended repair functions. HRV is 30 tonne class recovery vehicles built as variants of in-service 8x8 vehicle. This commonality ensures simplified spares inventory and crew training leading to easier and more efficient logistics.

This document explains the requirement Technical specifications for hydraulic crane & the scope of work for the Supply of cranes has been brought out in the document.

2 HRV 8x8 VEHICLE SYSTEM DESCRIPTIONS:

- a) Base Vehicle - BEML 8x8 High Mobility Vehicle
- b) Recovery aggregates
 - Crane - 20 tonne with 2m radius
 - Main Winch - 15 tonne Direct Pull
 - Auxiliary winch - to handle Main winch Rope
 - Dozer Blade
 - Suspended Towing Mechanism
- c) Repair aggregates
 - Welding
 - Repair Tools & Accessories

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

3 Technical specification of BEML HRV 8x8 Vehicle

3.1 Technical Specifications of Base Vehicle (For information)

Sl. No.	System Description	Technical Specifications
1	Weight	The Gross vehicle weight (GVW) of the BEML HRV will be around 30 tons including all types of hydraulic oils and mounted equipment.
2	Dimension	
	(a) Length	(1) From Dozer blade to tailgate /rear tow hook:- will be around 11000 mm
		(2)Maximum permissible overhanging of crane /under lift, in stowed position, beyond tailgate/rear tow hook:- will be within 1500 mm
		(3) total length (1)+(2) will not exceed:- 12500mm
	(b) Width	will be 2570 mm with Dozer
	(c) Height	Height of the vehicle will be below 3380 mm
3	Obstacle Negotiation(with complete load except casualty in Suspended Tow)	
	(1) Fording depth (without preparation)	1000 mm
	(4)Angle of departure	25°
	(5) inclination/Tilt	15°
	(7) Grade ability (Laden condition)	15°
4	Transportability	Rail transportability of the proposed HRV will be on broad gauge with ODC clearance for B- class vehicle
5	Durability	The HRV will have a life span of 1,20,000 kms or 20 years whichever is earlier with one mid life intervention.
6	Painting	Vehicle will be supplied with in - service olive green matte finish color anti corrosive paint on exterior. In addition the tools & accessories also will have an anti corrosive coating.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

Sl. No.	System Description	Technical Specifications
7	Lubricant	The lubricant system will be with provision for indication of oil level of all critical lubrication systems including hydraulic systems. An audio visual alarm will be activated in case oil levels of engine oil, crane hydraulic system are sensed below / above specified levels.
8	Electrical System	Standard 24 volts DC supply. Battery consists of 2x12 V, 200 Ah connected in series Double pole wiring with color codes and numbering of electrical cables for the ease of identification
9	Terrain and Climatic Condition	The HRV will be capable of performing at all altitudes up to 5000 m above mean sea level with altitude kit. Vehicle operation Temperature range: minus 15 deg C to +55 deg C
10	Miscellaneous	(c) Protection against High Voltage Electrical line:- High voltage audio visual warning will be provided in drivers panel to warn the driver at a minimum radial distance of 30mtrs, when the crane approaches high voltage line. (Crane OEM to be supplied & needs to be fitted on the vehicle / Crane structure, can be finalized during the design finalization stage upon discussion)

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

3.2 Technical Specifications of Hydraulic Crane Assy.

3.2.1 Desired Parameters of Hydraulic Crane Assy.

Sl. No.	System Descriptions	Parameters
	HRV should be provided with a hydraulically operated telescopic boom crane.	
(a)	Desirable operating speed in un-laden condition:- <ul style="list-style-type: none"> • Boom Extension speed (meter/min) - 4.3 m/min • Boom extending time - 50 Sec • Hoisting (single line) - 50 m/min • Slewing - 240 deg / 30 Sec 	
(b)	The specifications of the boom should conform of the following:-	
	(i) Lifting capacity (without jib extension) :	20 ton @ 2 m radius on outrigger (Payload is 20 tonne, excluding hook weight, rope weight & sheave block weight etc.,)
	• Boom length	5.5 m - Closed condition
	• Maximum load radius	3.5 m
	• Maximum lifting height on hook	6.0 m
	• Maximum boom lifting angle	65 deg
	(ii) Lifting capacity (at full jib extension) : Both Rear & Side lifting	3 ton @ 7 m radius on outrigger
	• Length of boom	9.0 m - open boom condition
	• Maximum load radius	7.0 m
	• Maximum lifting height on hook	9.0 m
	• Maximum boom Luffing angle	65 deg
	• Maximum side working radius with boom fully extended	7.0 m
	(iii) Lift & slew of crane	10 ton @ 3.2 m radius on outrigger, with minimum of 1.9 m outreach

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

Sl. No.	System Descriptions	Parameters
	(iv) minimum reach without jib extension as measured from driver / co driver side :	Reach without jib extension, as measured from driver / co driver side of the vehicle: At least 750 mm with 20 ton load.
	v) minimum reach with full extension as measured from driver/co driver side of the vehicle.	Reach with full extension as measured from driver / co driver side of the vehicle: At least 5.75 m with 3 ton load.
	(vi) Angle of slew :	120 deg on either side of the vehicle towards vehicle rear.
	(vii) Rear pulling capacity at first layer of cable	~ 2.9 tonne
	Suspended Towing Mechanism: (vii) Should have a Hydraulic Suspended Towing mechanism as part of Crane structure along with the Crane Boom, which Should be able to rig vehicle casualties in suspended tow, up to a weight classification of in-service 8x8 wheeled vehicles.(16.2 tonne). The mechanism should be designed such that the lifted load should transfer to the Crane base, so that the load distribution is equal to all the vehicle axles. Vendor should take concurrence from BEML before finalizing the design along with the load distribution. Features of Suspended towing mechanism: Suitable linkage to be provided, <ol style="list-style-type: none"> 1. To lift the tow bracket 2. To lift the bumper 3. To Lift the axle with the help of tires 	
(c)	Crane Life :- The operational life of crane should be minimum 20 years.	
(d)	Controls:- The crane should be operable by means of hydraulically from the controls located on both sides of the vehicles. An additional external portable wired console with minimum 20m length will also be provided.	
(e)	Safety	
	(i)Provision should exist to lock the boom in any position, length & hold the hoist cable with load in case of any failure. Provision for emergency unloading of load from the crane, in case of failure, should also be provided .	

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

Sl. No.	System Descriptions	Parameters
	(ii-a) Overload Protection:- The crane should have a provision for protection against over-loads. (ii-b) Crane Lifting Load Warning Device: It should have an Audio Visual Warning Device to give alarm on reaching 85% of the maximum crane capacity	
	(iii) The strength of the boom rope should cater for breaking strength not less than twice the specified lifting capacity of the crane.	
	(f) Hoist winch rope:- The length of crane rope should allow the HRV to fulfill all its defined roles.	
(g)	Super structure: Super structure of the Crane should be designed in such a way that, it accommodates Crane slew base, as well as mounting of Recovery Winches (winches are in BEML scope) on the rear side of the super structure along with outriggers, suspended tow mechanism. Vendor should carry out Super structure design finalization in consultation with BEML. Installation of the super structure on the chassis has to be decided/ finalised in consultation with BEML, all the required Hardware are in vendor scope like U-Bolts, pads, nuts & bolts etc.,.	
(h)	Out-rigger Jacks and Jib Support: Retractable out-rigger jacks (4 Nos.) should be provided for ensuring stability of the vehicle throughout the slewing range, for all specified loads and terrain. The out-riggers should be operable hydraulically & be capable of smooth locking (including legs) in any adjustable position. Positive locking arrangements for securing these out-rigger jacks should be provided, when these are not in use,. - Front 2 Nos. + Rear 2 Nos. outriggers should be retractable, Hydraulically operated for vehicle stability during Crane operations & - Rear 2 Nos. outriggers should be retractable, Hydraulically operated that will be used for rear anchoring purpose while winching operation. The design of Outrigger to be finalized in consultation with BEML.	

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

Sl. No.	System Descriptions	Parameters
(i)	<p>The crane should be capable of performing at all altitudes up to 5000 m above mean sea level. The crane is able to operate in the temp conditions obtaining in Plains / Deserts / High Altitude Area within the country as under:</p> <p>(a) Plains/Deserts.</p> <p>(i) Minimum Temperature : Between 0°C to 5°C</p> <p>(ii) Maximum Temperature : Between + 40°C and + 55°C</p> <p>(b) High Altitude Area (Road Bound Equipment)</p> <p>(i) Minimum Temperature : Between minus 15°C and minus 5 °C</p> <p>(ii) Maximum Temperature : 40°C or as actually obtained in locations where proposed to be used.</p>	

NOTE:

- 1.OEM to submit the Lifting performance graph with the above parameters.
- 2.In order to keep the overall vehicle weight less, the overall weight of the Crane Assy (including the super structure along with the jacks, Crane Hydraulic system with Tools & Accessories) to be approx. around 7 to 8 tonne,
3. The max. permissible GVW of HRV 8x8 vehicle is 30 tonne (max.), hence we need to optimize and maintain the weight with in this limit.

3.2.2 Recovery Accessories related to Hydraulic Crane Assy.

OEM Should supply the required Accessories which are required for carrying out the recovery operations with Hydraulic Crane.

The details of Accessories required for Crane recovery operations are listed below, however apart from these list, if any other accessories which required to be indicated & supplied by OEM.

1. **Search Lights:** Qty 02 Nos. of adjustable, revolving and detachable search light of min 50 watt each should be provided. an Extension cable of 150 m length along with cable collector should be provided to use the light in the detachable mode.
2. 4 leg - Lifting sling to lift Major unit assemblies of equipment
(Weight of 15 tonne) - Qty 1 No. (Details will be provided during PDR / CDR)
3. Chain Slings
 - Two Leg Chain - 2 Nos (Capacity of 20 tonne)
 - Three Leg Chain - 1 Nos (Capacity of 20 tonne)
 - Four leg Chain - 1 No. (Capacity of 20 tonne)
 - Flat polyester-Nylon lifting belt - 4 Nos. (Listing capacity of 10 tonne each & length of 10 mt each)
4. D-Shackle - 2 Nos. (Capacity of 20 tonne)
5. D-Shackle - 4 Nos. (Capacity of 5 tonne)

3.2.3 Other Features of Hydraulic Crane Assy.

i) Hydraulic System:

- a. Pumps: Hydraulic pump driven from PTO (Pump & PTO are in BEML scope) mounted on transmission, sizing of the pump will be finalized in consultation with vendor, based on the requirement parameters of Crane, Winches and other hydraulic accessories. Available PTO output power is 55 kW @ 1550 rpm.
- b. Control Valve: Control valve for operating the Crane is in vendor scope, BEML will be providing Pressure line (P), Tank line (T), Leak line (L) & LS line (LS) from the pump & reservoir.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

-
- ii) **Controls:** The Crane is operable from the controls located on both sides of the vehicle. An additional external portable wired console with minimum 20 m length is also to be supplied.
- Lock valve to be provided in lift cylinders, Boom extension cylinder and Brake provided on Hoist to lock the boom in any position, length & hold the Hoist cable with load in case of any failure.
 - Provision for emergency unloading of load from the Crane, in case of failure, provided by using hand pump. Hand pump also to be supplied by Crane Vendor.
 - Overload protection:** The Crane should have a provision for protection against over-loads.
 - Crane Lifting Load Warning Device:** It should also to be provided with an audio / Visual warning device to give alarm on reaching 85% of the maximum Crane capacity.
 - Factor of safety of Hoist Rope should be twice the Max. Permissible line pulls.
- iii) **Protection against High Voltage Electrical Line:** High voltage audio visual warning should be provided in driver panel to warn the driver at a minimum radial distance of 30 m, when the crane approaches high voltage power line. Multiple sensors have to be provided along the length of the crane boom (vendor scope, this has to be provided along with Crane system)
- iv) The required payload requirement defined at essential parameters heading does not include the weights of rope, Hook block, slings and all similar load handling devices.

3.2.4 Additional requirements of Hydraulic Crane Assy.

- The HRV Crane should be able to start and reach full operable status within 5 minutes after it has remained dormant for up to 24 hrs, in plains.
- Essential spare parts, tools and accessories of the HRV Crane Assy should be supplied.
- Reliability: The operational life of crane should be minimum 20 years & should be indicated by translated into Hrs.
- Maintainability: The Crane Assy system should be easy to maintain under field conditions. Maintainability should confirm to the following:-
 - Time taken to remove and refit any Major Unit Assemblies (MUAs) of the Crane Assy, by two tradesmen. shall not exceed 20 hours. under field conditions.
 - It should be possible to inspect visually and to test the functioning of the components / parts of the Crane system.
 - Slew unit & hoist units should be capable of being replaced by 2 tradesmen within 4 Hrs.
 - Any parameter which cannot be trial evaluated due to lack of test facilities or equipment or terrain will be accepted based on certification of the Accredited Lab (NABL)/OEM/Vendor in that sequence, if required on mutual discussion.
 - Standardization: Indian Standard Fuel, Oils and Lubricants (FOL) should be used.

3.2.5 Quality:

The details of quality assurance / control programs, proposed to be adopted for the system, would laid down by the vendor.

The vendor should provide all test certificates for acceptance inspection by BEML quality team & also required to train the team as required.

The following standards, as applicable, compliance shall be adhered to:

- a) EMI / EMC - MIL STD 461 E/F
- b) IEEE 12207 - Software Development ad documentation
- c) All electrical & Electronic Equipments - As per: JSS 55555
- d) Characteristics of 28 Volt DC Electrical Systems in Military Vehicles - As per MIL-STD-1275B
- e) MIL STD 810 G (for imported equipments) or JSS 55555:2012 Rev:3 (for indigenous equipment) - Environmental test specifications
- f) JSS-0251 -2002 (Rev) / EDD- S-048 and IETM Level 4 - Documentation.

Note:

1. OEM should provide CoC for all the electrical / electronic fitted aggregates as part of the crane system.
2. & also in case required by end user, cost for conducting the physical testing for the electrical / electronic aggregates fitted on equipment from NABL accredited lab to be quoted separately as an optional.

4 Scope of Work

OEM has to provide Technical & commercial responses and also should provide crane outer profile - 3D model in neutral format for telescopic boom type Crane.

Scope of work for the engineering of crane will be categorized as follows

- Application Engineering
 - a. Preliminary Design Review (PDR)
 - b. Critical Design Review (CDR)

- Development, Testing & Supply

Support during commissioning & factory trials

- Training
- Support during User Trials

4.1 APPLICATION ENGINEERING

- OEM shall start this activity immediately after placement of Purchase order.
- The scope envisages that the OEM technical team shall collaborate with BEML design team to study the engineering aspects of the crane & its locations in the vehicle.
- The details of Base vehicle & space volume available for mounting of crane in enclosed in Appendix A.
- OEM rep. shall visit BEML for discussion & finalization of application engineering at BEML premises.

The following essential features shall be considered during Application engineering

- Mounting orientation & placement on the Base vehicle
- Mounting details on the Base vehicle
- Hydraulic & Electrical System parameters.
- Safety features associate with crane operations & accessories.
- Accessibility to vital areas for checking / adjustments and routine maintenance.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

-
- Details for Routing & guiding of wire rope, Pulleys, hydraulic cylinders (for luffing and boom extension) and their mounting.
 - Details of slew bearing, slew gear & Slew unit
 - Concealing arrangement to address Fording.
 - Sizing of Pulley blocks, Shackles, outriggers sizing, placement of outriggers & other fixing / anchoring accessories
 - Loading hook design calculations.
 - Sizing of Main Pump for the operation of Crane in consultation with BEML, based on the inputs of other recovery aggregates like Main winches, Aux. winch, Dozer and Suspension towing. OEM to provide these hydraulic input requirements for selection of Pumps in concurrence with BEML.

Phase 1: Requirements to fulfill Preliminary Design Review (PDR) – 2 weeks from purchase order placement

- OEM should provide the Technical details containing the following to full fill the PDR
 - Crane Design parameters & Calculations meeting the crane envelope & Weights specified.
 - Configurations of Crane for arriving at conceptual vehicle layouts
 - Hyd. system with Circuits & operating parameters
 - Electrical inputs required
 - Control system details with interlocks
 - Details of Special maintenance tools & Testing equipments
 - The details of accessories
 - Finalize all the features of recovery crane.
 - Finalize crane layout.
 - 3D models of crane to be provided in Neutral formats(IGS /STEP)
 - 2D Drawings of crane to be provided along with the BOM.
 - Details of Factory acceptance Tests (FAT) plan (needs to be conducted at OEM premises) and shall also provide the information about the test facilities available along with the time schedule for executing these Factory acceptance tests.
 - Activity Plan (PERT, GANT & Road Map)

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

- Design of outriggers capacity
- Design finalization of the Crane super structure along with the outriggers positions
- Mounting details of the Crane super structure on the vehicle chassis.
- OEM should participate in PDR meeting at BEML premises.
- The above deliverables will be reviewed & accepted by the BEML to proceed to the next stage.

Phase 2: Requirements to fulfill Critical Design Review (CDR) – 4 Weeks from purchase order placement

OEM should provide Technical details containing the following to full fill the CDR

- Design Verification of crane installation
 - Design justification for selection of slew bearing & Slew Unit
 - Design justification for selection of all hydraulic aggregates.
 - Hoisting winch selection and criteria
 - Design calculations for crane/vehicle stability, required inputs related to Base vehicle will be provided.
 - Design justification for hoisting winch rope routing
 - Justifications and details of all Safety features
 - Detailed BOM of Crane system along with the super structure, Outriggers, Hyd. system, pumps, Oil coolers & its accessories etc.,
 - Support structure design for mounting the Crane.
 - Structural Reliability reports
 - Compliance report addressing all features of the crane.
-
- The OEM shall provide all necessary details for proper installation with mountings details of the Crane.
 - Recommended list of Spares for Maintenance & Repair
 - OEM should participate in CDR meeting at BEML premises, the details of the above in report format to be submitted to BEML in prior for review.
 - The above deliverables will be reviewed & accepted by BEML to proceed for further development.

4.2 DEVELOPMENT, TESTING AND SUPPLY – 4 Months from purchase order placement

- OEM should Develop / Customize 1 Nos of Hydraulic crane Assy to **BEML part Number: 506 CJ 03001** & Spares kit (Running spares) to **BEML part Number: 506 CJ 00118**
- The Crane system should incorporate all the features that are finalized in the PDR and CDR

Paint Specification:-

Vehicle should be supplied with in - service olive green matte finish color anti corrosive epoxy paint on exterior. In addition the tools & accessories also will have an anti corrosive coating.

The exterior side of the crane & all steel components except the threaded bolts, nuts & Ropes should be painted. Two coats of ready to use paint should be applied. Olive green matte finish color anti corrosive epoxy paint should be painted for crane as per standard IS: 14925 / equivalent.

In addition the tools & accessories also will have an anti corrosive coating.

Cleaning - All steel parts to be painted shall be ensured, complete removal of grease, rust, scale, corrosion, slag etc.

Preservation - After inspection and testing, all unpainted ferrous parts which have got relative motion shall be thoroughly cleaned and coated with grease. Lubricating oil will be put in all oil holes provided on the equipment.

4.3 TESTING [Factory Acceptance tests (FAT)]

- The OEM shall be responsible for the FAT of the crane at their premises.
- The detailed FAT plan and execution shall cover the following minimum aspects
 1. Inspection of Physical parameters & dimensions
 2. Checking the BOM
 3. Performance tests under normal operating conditions & maximum operating conditions.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

4. Inspection of Safety features under all operating conditions of Crane
- OEM should inform the FAT schedule well in advance to BEML.
 - BEML team will participate & witness the FAT in OEM premises at their own cost.
 - For any failures of Crane during FAT, OEM shall at his own expense, take necessary action, such as, rectification, readjustment, design changes (including software modifications if any), etc until the satisfaction of the BEML in order to meet the design criteria.
 - In case of failures & rectifications, OEM shall re-test the Crane system to meet the design criteria.
 - Following points shall be complied during FAT
 - (1) The OEM shall present a comprehensive FAT Program before the commencement of actual testing.
 - (2) All test equipment shall carry an appropriate and valid calibration label.
 - (3) OEM shall be flexible to amend the Test procedures, to reflect changes in system design or for any additional tests recommended.
 - (4) All costs including labor, supervision of testing, provision of specialized equipment and materials, and the cost of hiring Consultants and the services of other specialized personnel or independent assessors etc shall be borne by the OEM. The OEM shall also bear any expenses incurred due to re-testing caused by defects or failure of equipment or any other account to meet the requirements of the contract.
 - (5) The OEM shall sign all reports of Tests that shall be countered by accepting authority (BEML reps)

NOTE: Detailed FAT plan shall be provided by OEM during CDR.

5 SUPPLY

5.1 STORAGE, PACKING CRATING AND MARKING

- The OEM shall provide all packing, crating and markings necessary for logistics during delivery of the complete set of Crane system. Crane associated spare parts, special tools and testing equipment. Each component / Assy. shall be packed to withstand transit damages.
- The OEM shall provide the instruction for proper storage, handling and functions of components supplied by the OEM.
- All items shall be labeled with the maker's name & the type, discrete serial number & rating, the date of manufacture of the equipment and Part No / Drg No.

5.2 DELIVERABLES

- a) **Crane Assembly with BEML part Number: 506 CJ 03001**, which includes aggregates of crane such as Boom structure along with the super structure, outriggers (2 Nos. Front, 2 Nos. Rear convertible or 2 + 2 Nos rear, 1 set for Crane out riggers & other set for rear anchoring), Suspended Towing mechanism, other Crane assy relates items & Electrical end connectors, Hydraulic related routings, items / fittings and crane mounting bolts, super structure mounting base vehicle related hardware etc.,
- b) **Spares kit (Running spares) to BEML part Number: 506 CJ 00118**
- c) **Accessories of crane to BEML Kit No.: 506 CJ 00126:**

The following accessories are to be provided for the Crane operation in addition to any other accessory as deemed necessary by the OEM-

- **Search Lights:** Qty 02 Nos. of adjustable, revolving and detachable search light of min 50 watt each should be provided. an Extension cable of 150 m length along with cable collector should be provided to use the light in the detachable mode.
- 4 leg - Lifting sling to lift Major unit assemblies of equipment (Weight of 15 tonne) - Qty 1 No.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

-
- **Chain Slings**
 - Two Leg Chain - 2 Nos (Capacity of 20 tonne)
 - Three Leg Chain - 1 Nos (Capacity of 20 tonne)
 - Four leg Chain - 1 No. (Capacity of 20 tonne)
 - Flat polyester-Nylon lifting belt - 4 Nos. (Listing capacity of 10 tonne each & length of 10 mt each)
 - D-Shackle - 2 Nos. (Capacity of 20 tonne)
 - D-Shackle - 4 Nos. (Capacity of 5 tonne)
- d) **Diagnostic Software if any in DVD for Crane operations.**
- e) **Performance Guarantee & Warranty as detailed further in the document.**
- f) **Inspection check lists for safe operation of the Crane**
- g) **Manufacturer's Recommended List of Spares (MRLS) for 2 years per vehicle: 506 CJ 00134 -To be supplied as per OEM recommendation, Annexure "I" - List as well as Items recommended to be supplied**
- h) **SMT/STEs, Jigs, Fixture and Infrastructure: 506 CJ 00142 - To be supplied as per the OEM recommendation, Annexure "II" - List as well as Items recommended to be supplied**

The OEM should supply the maintenance spares, special tools and testing equipment

i. **Maintenance Spares:**

The OEM shall supply recommended electrical & mechanical running spares / consumables including lubrication schedule required for periodic maintenance activities of the Crane system for the above specified period.

ii. **Tools:**

The Tools shall be categorized as follows:

- General Maintenance tools

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

OEM to provide all necessary tools and tackles required for preventive/predictive maintenance activities of the Crane system.

- Special maintenance / over hauling tools

OEM to provide all necessary special maintenance tools required for overhauling of Crane system.

iii. Testing equipments:

All essential equipment and its accessories required for testing / diagnostics of Crane system should be provided for ensuring proper functioning of Crane. The testing / diagnostics equipments may be broadly classified as:-

1. Mechanical Equipments
2. Electrical Equipments
3. Software if any.

i) Test reports / Certificates are to be supplied by the manufacturer.

- i. Factory Acceptance Test (FAT) Report for Performance Testing & Acceptance at OEM premises certified by BEML reps.
- ii. Raw material test certificate
- iii. Compliance certificates for the crane aggregates / components from the OEM's, meeting applicable MIL STDs detailed in PTS document.
- iv. Charphy test for structure at room temperature to evaluate low temp impact energy
- v. Hydraulic pipe line pressure test report (Hydraulic hoses and metal pipe)
- vi. Welding test for major component/ sections
- vii. Certificate of Conformance from OEM for all sub systems/components like valves, hydraulic motor, gear box and sensors
- viii. Endurance test of the crane for one hour duration and oil temperature rise during the period
- ix. Sinking test report for lift and boom cylinder in loaded condition
- x. Testing of safety interlock, fail safe operation and emergency operation of crane through separate hydraulic hand pump.

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

- xi. Loading /Unloading of major systems of crane with time measurement
- xii. Load test: total 80 operations loading and unloading with dummy simulated load & 20 operations each at following positions of crane boom-zero deg, 90 deg and at 120 deg on either side of crane slewing positions.
- xiii. Operation speed test: During load test at max. lifting capacity, the following observations are to be made / taken as per specifications:- Boom extension, derricking speed, slewing angle, load lifting speed with winch and inching speed (to reduce all operational speed to 50-60% of max speed) and report to be submitted

Note: The Documents Management System and Language used should be in English only.

- j) **Drawings and documents are to be supplied by the manufacturer as mentioned below to be submitted to BEML P/n. 506 CJ 00159**

1	Design related document consists of the following (Sl. Nos 1.1 to 1.6) - Qty: Each one set soft copies (in external hard disc/CD), one set of hard copies.
1.1	2D drawings General Arrangement & Installation of sub assembly Drawings of the Crane & accessories
1.2	Bill of Materials
1.3	3D Model of crane in soft copy format (IGES / STEP)
1.4	Design & Analysis Documents (Hand calculations, FEM and other analysis for part & assembly)
1.5	Final Configuration documents
1.6	Brochure & Catalogue (Salient features & specifications with 3D illustrations and exploded views)
2	Quality & Testing Documents consists of the following (Sl. Nos 2.1 to 2.5) - Qty: Each one set soft copies (in external hard disc/CD) & one set hard copy
2.1	Quality Assurance Plan (QAP)

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

 Date : 30th Jul 2021

2.2	QT/AT & Acceptance Test Plan (ATP)
2.3	Inspection Report Sheets (IRS)
2.4	Functional Testing Methodology (FTM) for assemblies
2.5	Procedure for Testing of Hydraulic Systems & Controls
3	Users Documents consists of the following (Sl. Nos 3.1 to 3.7) -
3.1	User Hand Book / Operators Manual (English and Hindi)
3.2	Design Specifications
3.3	Technical Manual <ul style="list-style-type: none"> • Part 1: Tech Descriptions, Specifications, Functioning of various aggregates of Crane • Part II: Inspections /Maintenance tasks, repair procedure, materials used, fault diagnosis and use of special maintenance Tools (SMTs / Special Testing equipments(STEs) • Part III: Procedure assembly / disassembly, repair up to component level, safety precautions. Fording - Preparation & Operation • Part IV: <ul style="list-style-type: none"> ○ Part list with drawing reference ○ List of SMT / STEs with test bench
3.4	Manufacturer's Recommended List of Spares (MRLS) as per the defined format
3.5	Illustrated Spare Parts List in text & Album (ISPL)
3.6	Technical Manual on STE with drawing reference
3.7	CD/DVDs on the above Tech Literature Incl IETM (Level IV)
4	Engineering Support Package (ESP) consists of the following (Sl. Nos 4.1 to 4.9) - Qty: Each one set soft copies (in external hard disc/CD) and one set hard copy

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

4.1	Servicing Schedule
4.2	Field Inspection Standards
4.3	Preservation Instructions
4.4	Packaging Specifications
4.5	Field Repair Manual
4.6	Design Specifications
4.7	Base Repair Manual
4.8	Overhauling & Reconditioning Instructions
4.9	List of Installation Kits
5.	Supply of Training materials as per the Heading "Training" as below should be supplied <ul style="list-style-type: none">- Charts- Slides- Training Brochures- Blow up diagram- Video films

5.3 COMMISSIONING AND FACTORY TRIALS

(Schedule to OEM: will be informed as project progress)

5.3.1 Commissioning of Crane assy on the base vehicle:

Installation & commissioning of Crane assy on the base vehicle is in OEM scope. OEM is responsible for the effective commissioning / installation of Crane system which includes super structure, Crane system, Crane Hyd. system, Crane electrical system, out riggers, suspended towing mechanism etc., on the base vehicle at BEML premises at EM division KGF and thereby ensure effective commissioning, testing & internal trials.

5.3.2 Performance Tests of Crane system after commissioning on the vehicle at BEML Premises:

OEM is responsible for operational performance / tests of the Crane system which includes outriggers & suspended towing mechanism engineered on the equipment, at BEML Premises. OEM shall be responsible for any malfunctioning/defect identified during the performance tests. OEM shall sign all the test certificates during the course of the acceptance tests at BEML.

NOTE:

- ATP (Acceptance Test Plan) for the Crane system fitted on the equipment performed at BEML during internal trails will be provided to OEM.

5.3.3 SUPPORT DURING FIELD TRIALS - (ON NEED BASIS)

BEML Team will participate in the User trials at User Specified locations in India.

- OEM should provide engineering support (skilled man power) during field trials.
- OEM shall take responsibility for any defect or failure of Crane system during the trials & necessary remedial actions and corrections to be executed immediately.

6 TRAINING:

The OEM should provide Training to BEML reps / User reps in India for a period of 5 working days with the require Training aids like

- Charts
- Slides
- Training Brochures
- Blow up diagram
- Video films

The training shall cover the following minimum topics

- Operation
 - Mounting & Dismounting of the crane aggregates from the vehicle
 - System safety,
 - Maintenance,
 - Replacement of the spares, etc.
- OEM shall provide tentative training program & schedules.
- OEM should provide all the necessary training aids & materials. After completion of the training, training aids and materials used shall become the property of BEML.

7 OTHER TERMS AND CONDITIONS

7.1 WARRANTY

Notwithstanding inspection & acceptance by BEML of the hardware under this contract or any clause concerning the conclusiveness thereof, OEM shall provide warranty for a period of 36 months for the first crane supply with 12 months to end user on delivery, that hardware is free from defects/failures due to workmanship, material or manufacturing non-conformance. The OEM shall be responsible for any defect or failure of equipments provided in the Crane, special tools, test and diagnostic equipment, maintenance and unit exchange spares due to defective design, material or workmanship.

The repair and/or replacement of failed components and installation of repaired/replaced components shall be taken by the OEM on his own charge at the Site (BEML' works, India).

The OEM shall bear custom duty, freight charges and all other expenses involved in collection of defective components and equipment from the Site, and transportation to the manufacturer's works in India and its return to Site after repairs. Further, OEM should do any design modification required to any components or equipment as a consequence of failure analysis and modification shall be carried out free of charge.

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

7.2 MATERIALS AND WORKMANSHIP

The OEM shall be responsible for meeting the requirement of constructional details, materials & workmanship. All materials and workmanship shall be in every respect in accordance with the proven up-to-date best practice.

All the components used in the construction of this supply shall be from fresh and present stock and not from older stocks. OEM shall provide necessary material certificate to this effect.

100% visual inspection of all components shall be carried out and the components/assemblies shall be free from any defect. Stage inspection should be carried out. All threaded fasteners should turn freely without jamming and to be lubricated wherever called for.

7.3 PRODUCT SUPPORT:

The OEM shall be required to confirm that he is in a position to provide product support in terms of maintenance, material, and spares for a period of minimum 20 years. The OEM must provide at least 2 Years notice to BEML before closing the production line so as to enable “LIFE TIME BUY” of all the material & spares before closure of the production line. All upgrades & modifications carried out on the equipment during the life cycle must be intimated to buyer.

8 INDIGENISATION:

This project is being executed under indigenization program of BEML, accordingly the Crane manufacturer under ‘Buy (Indian)’ category refers to the acquisition of products from an Indian vendor which may not have been designed and developed indigenously, having 60% IC on cost basis of the base contract price. Vendors eligible in ‘Buy (Indian-IDDM)’ category will also be permitted to participate in this category with indigenous design and a minimum of 50% IC on cost basis of the base contract price.

-----XXXXXXXXXXXXX-----

Technical Specifications of Hydraulic Crane for BEML HRV 8x8

Doc. No.: GA/R&D/CRANE/HRV 8x8/ /2021/1100 Rev-01

Date : 30th Jul 2021

Appendix A

