Technical Specifications

Preface - Instructions to Bidders

Introduction

These Technical Specifications identify the technical requirements of the Goods and Services which are the subject of this tender.

The Technical Specifications are presented in four parts as follows:

A. Scope of Supply

B. Specific Project Requirements

C. General Requirements

1) *Geography and Climatic Conditions*
2) *Goods (Equipment and Machinery)*
3) *Services*
4) *Standards*
5) *Supplier's Responsibility*
6) *Spare Parts Provisions*
7) *Availability Provisions*
8) *Deemed Breakdown*
9) *Composite Warranty / Guarantee*
10) *Quality Assurance*

D. Equipment Specifications

Technical Response

Bidders shall provide Clause by Clause commentary demonstrating compliance with the Purchaser's Technical Specifications, together with full supporting technical literature and data sheets.

Wherever graphical representation of data (e.g. load, power, performance curve) is required, the grid axis and data shall be properly and clearly labeled for ready comprehension. Additionally, Bidders shall provide the information specifically requested in the Attachment to the Technical Specifications.

Failure to demonstrate compliance in all respects with the requirements of the Technical Specifications may render the bid non-responsive.
Failure to provide any information requested in any part of this specification may deem the bid non-responsive.

Site Visits

The Bidder prior to making any Bid calculation and as part of the preparation of its Bid, shall be deemed to have visited and inspected the Site(s), made all enquiries and collected all information documentary or otherwise, including climatic conditions, as considered necessary by the Bidder for the proper and accurate preparation of its bid.

A Bidder may visit the Site(s) by prior appointment with the purchaser. The number of Bidder's representatives permitted to make visits to the Site(s) shall be limited to a maximum of two.

Bidders wishing to make appointments for Site Visits should do so in writing or by facsimile directly with the subsidiary company and concerned officer as detailed in the following schedule. Copies of all such communications should be sent to:

General Manager (MM)
(Subsidiary Name & Address),
Telephone No. ……
Email: …….
Website: ……

Part A

Scope of Supply

A.1 Equipment Package

The Supplier is required to provide a complete package of equipment for the supply of …… to opencast (surface) coal mining projects as per the Technical Specifications provided in Part D.

The supplier is required to supply the equipment along with accessories, consumables, training, installation, commissioning and testing at the coal mining project.

The package includes Consumables including oils, greases, lubricants, for 12 months of warranty period from the date of commissioning of the equipment and thereafter Spare parts & Consumables throughout **Cost Cap Period** of …….

The Scope and Phasing of supply for the.....is given in 'Schedule of requirement'.

A.2 Supplementary Items

The equipment shall be provided with a comprehensive tool kit which shall include any special tools required for erection and commissioning of equipment. First fill of all oils, greases and lubricant needed for test, erection and commissioning of equipment shall be supplied by the supplier free of cost to purchaser.

A.3 Information and Drawings

At least one month before the scheduled installation date, the Supplier shall provide not less than:

(a) Suitably illustrated copies of Operating, Repair and Maintenance Manuals for each type/model of equipment and accessories, written in English language, substantially bound in book form;

One hard copy along with soft/digital copy to each project site; and

Soft/digital copy of the same to the General Manager (Excv.)/HOD, Subsidiary Hqrs. and General Manager (EED), Coal India.

(b) Suitably illustrated copies of detailed Spares Parts Manuals for each type/model of equipment and accessories, written in English language, substantially bound in book form;

One hard copy along with soft/digital copy to each project site; and

Soft/digital copy of the same to the General Manager (Excv.)/HOD, Subsidiary Hqrs., General Manager (EED), CIL; General Manager (MM)/HOD subsidiary Hqrs and General Manager (MM)/HOD, CIL.

In addition to the Equipment drawings, where appropriate the Supplier shall supply detailed relevant drawings (in the same number of copies) illustrating erection/assembly site(s), foundation and accommodation requirements for such items as drive motors, switch installations etc.

A.4 Erection/Assembly, Commissioning and Performance Testing:

The Supplier shall provide the Services of Specialist Technicians and required manpower (skilled/semi-skilled/unskilled) to undertake the installation/erection/assembly, commissioning and performance testing of the Equipment and accessories supplied. The purchaser will assist in providing necessary facilities like erection tools and tackles (supplied along with equipment), cranes with operator and electricity during erection and commissioning. **No manpower shall be provided by the purchaser during Erection/Assembly, Commissioning and Performance Testing.**

The technicians shall remain at site following commissioning and until all necessary personnel are fully conversant with the maintenance and operation of the equipment. **(refer Part – C.3).**

A.5 Training:

A.5.1 Compulsory Training

The training shall be completed in batches within warranty period from the date of commissioning of the equipment in the respective project**.** The supplier in consultation with the project in-charge / HOD [Excavation] of the respective site shall make available experienced personnel to conduct training of engineers, supervisors, technicians and operation personnel for specified period as mentioned in table given in 'Schedule of Requirement of Services' from the date of issue of acceptance certificate of the equipment. The training shall cover the following:

a) Training on simulator module by the bidder at their works/suitable location in India/suitable end user's location is mandatory for shovel, Dumper & Dozer. For rest machines training on simulator is preferable,
b) Equipment system, safety and risk assessment.
c) Equipment operation and maintenance.
d) Trouble shooting, localization of fault and their remedies covering:
    1. Electrical and electronics
    2. Mechanical
    3. Hydraulic system
    4. Lubrication system
    5. Pneumatic system etc.

e) Training on Digital system of the equipment including OBD (on board display) and communication port data management, Health and productivity management system of the equipment, wherever applicable

Comprehensive training manuals with clear illustration shall be provided to each participant in English language. The training courses shall be conducted in both English and Hindi language.

Details of purchaser's estimates of the minimum training programme required for total fleet of equipment in a particular project is described in Schedule of requirement.

A.5.2 Additional training within the contract period after completion of warranty period

(a) The bidder shall give an undertaking in their bid to impart training to the CIL personnel at any time within the contract period after completion of warranty, in addition to the compulsory training as per provision of clause A.5.1.
(b) The additional training will be as per requirement of the user and the scope of training will be same as per the compulsory training provision of clause A.5.1.
(c) The training will be on chargeable basis and additional payment to the supplier will be made at same rate what individual supplier will be charged for compulsory training.

Part B

Specific Site Requirements

Project Specific Requirements

The equipment shall be suitable for use at the specific site projects under the conditions detailed below.

OCP

The …….opencast project is owned by the …….coalfields Limited, a wholly owned subsidiary of Coal India Ltd (the "Purchaser"). The mine is located partly in the …. District of ….. approximately ……km from …..rail way station.

Geological Conditions

(Soil & Sub soil condition to be indicated).

Power Supply

The Project will receive power at (…..kv through the …..Sub-station of the ……)

Mine Water Quality

PH value….
Total Suspended Solid ……(mg/ ltr)

Water Supply

Linked to the ……..

Part C

General Requirements

C.1 Geography and Climatic Conditions

Elevation:-
The natural surface varies from 100 to 1000 m above mean sea level.

Climate:-
The climate of the coal mines, where the equipment will be deployed, is sub-tropical to tropical, dusty, with a hot and humid atmosphere. Monsoon rains occur in the period from June to October.

Ambient Conditions:-

Relative Humidity - Maximum 98%

Temperature - Minimum 0^{o} C
Maximum 50°C

Rainfall: - The mean annual rainfall is 1,000 mm – 1,200 mm, 90 to 95 % of which may fall in rainy season from June to October.

Wind: - April to September - South to South Westerly
October to March - North Westerly

Wind Speed: - - 8 km per hr average
- 100 km per hr maximum

C.2 Goods (Equipment and Machinery)

Detailed specifications of the Equipment to be supplied are given in **Part D** of this section.

In general, all items shall be:

- Designed and constructed to handle without overload and for the working hours stated, the maximum volumes/rates specified;
- Designed to facilitate ready access, cleaning, inspection, maintenance and repair of component parts;
- Designed to facilitate rapid changeover of consumable items.

The supplier shall ensure that suitable latest technology available worldwide as on date shall be adopted in the quoted model of equipment and shall not be discontinued during life time of equipment. However, in case, technical up-gradation is unavoidable the same may be adopted in the supplied model of equipment with due clearance of Head of Excavation department of Subsidiary Co. Supplier shall not seek any technical modification / up-gradation at the cost of buyer before completion of contract period from the date of completion of guaranteed availability contract period of the equipment excluding if any modification / up-gradation is required for compliance of any statutory guideline issued from regulatory body of Govt. of India, DGMS, State Authority etc.

The component parts of all items shall, wherever possible, be selected from the standard ranges of reputable manufacturers and bidder shall disclose the manufacturer's name of all such items in their bid.

The Equipment and accessories shall be physically robust and where necessary capable of dismantling for transportation and ready re-assembly using simple tools. All Equipment items provided shall be designed to be compatible within the proposed overall Scope of Supply.

Electrical Equipment shall provide all protection devices, controls and interfaces for the Equipment to operate safely and efficiently.

All workmanship and materials shall be of first class quality in every respect.

All parts and surfaces, which are exposed to corrosive environment, shall be suitably protected to prevent any effects of corrosion or erosion.

C.3 Services

The supplier shall be responsible for the erection, testing and commissioning of the equipment at site. The supplier shall depute qualified and competent Engineer(s) and specialist technicians to supervise the entire subassemblies, erection and commissioning of equipment free of cost.

C.4 Standards

The design, supply, erection, testing and commissioning of all Equipment under this Contract shall in all respects comply with the requirement of this specification and with the appropriate current Indian standards and codes, or relevant Standards issued by the Indian/International Standards Organization or any other equivalent international standards, which corresponds to specific IS/ISO indicated in the technical specification. Such equivalent international standards are to be supported by documentary evidence certifying that offered standards are identical to the corresponding IS/ISO.

The equipment shall comply with requirements of the statutory government authorities, including Director General of Mines Safety (DGMS) having jurisdiction over the equipment and its use.

The system of units for all measurements shall be the **Système International (d'unités) (S.I.)**

C.5 Suppliers Responsibility

The Purchaser requires that the Supplier shall accept responsibility for the provision of complete operable and compatible Equipment and systems within the Scope of Supply. This document identifies only the major items required for the installation and the Supplier shall ensure that the total supply includes all necessary Equipment for it to function effectively, safely and efficiently. Any additional items the Supplier considers necessary to ensure compliance with such a requirement shall be identified and included.

If the Supplier observes that this Specification document contains any anomalies, ambiguities, flaws, errors or omissions, the Supplier shall immediately bring these to the attention of the Purchaser but not later than 15 days prior to the due date of opening.

The Supplier shall be responsible for the erection, testing and commissioning of the Equipment and ensure that it meets the requirements as specified. The commissioning and setting to work of the whole Equipment Supply package shall be carried out under the supervision of the Supplier in conjunction with the Purchaser's nominated personnel.

C.6 Spare Parts Provisions

C.6.1.a Availability of Spare Parts

All items and Equipment proposed shall be of current design and manufacture. The Supplier shall warrant that sufficient spares and servicing facilities will be available to maintain the Equipment in use throughout its life.

C.6.1.b Bought-out assemblies and sub-assemblies

The supplier is required to furnish the details of all Major bought-out items as indicated in the technical specification against "Information to be provided by the bidder".

C.6.2 Provision of Spare Parts

C.6.2.1 ..... Within the Contract Price, the Purchaser shall agree to purchase all Operational, maintenance and standby/contingency spare parts, consumable items /consumables spares, wear materials, maintenance tools and special tools (hereinafter collectively referred to as "Spare Parts", unless the context requires otherwise) in accordance with the Supplier's recommendations for ..... years. (*The period as indicated in equipment specification of individual equipment)* from the date of issue of the Commissioning Certificate. Similarly, within the Contract Price, the Purchaser shall also agree to purchase consumable items /consumables spares (hereinafter referred to as "Consumables") in accordance with the Supplier's recommendations for…… years (*the period to be mentioned as indicated in equipment specification of individual equipment*) from the date of issue of the Commissioning Certificate. The schedule of supply of consumables shall be as indicated in Schedule of Requirement during warranty period. In addition, the Supplier shall provide Spare Parts and Consumables for Commissioning.

Consumables shall include items such as oils, lubricants and fluids also.

Tyres, Trailing Cable, is not included in consumables.

However, additional two nos. tyres for each equipment required for first 12 months of warranty period should be supplied within 15 days from the date of commissioning.

The supplier shall submit a separate schedule showing consumables proposed to be supplied by them in the 1st (twelve) months period for each equipment from the date of commissioning of equipment as per 'Schedule of Requirement' to comply with the provisions herein contained.

Management and storage of spares and consumables from 2nd year of operation from the date of commissioning onwards (i.e. after completion of warranty period) till completion of contract period will be under the scope of the supplier. The Spares Cost Cap shall be equipment wise. The modalities of operation of Spares Cost cap model shall be as follows:

i) Reconditioned/Repaired/Refurbished spares/assemblies/sub-assemblies will not be supplied under Spares Cost Cap.

ii) The Spares Cost Cap shall be in Indian Rupees (INR) only and exclusive of estimated GST. Estimated GST shall also be indicated. The Spare Parts Stores/facility to be operated by the Supplier shall be GST registered storage facility or else the supplier will have to get the Stores/facility registered with GST authorities at least before commencement of Spares Cost Cap in the 2nd year of operation of the first equipment commissioned.

iii) The supplier shall submit the comprehensive Price List at least 6 months prior to the 2nd year of operation of the first equipment commissioned (in hard copy duly signed as well as in soft copy), covering all the spares and consumables and assemblies / sub-assemblies

etc. required during lifetime of the equipment to the Subsidiary of CIL (Tender Inviting Authority). They will examine the same with respect to any other Price List, if available, applicable on the first date of applicability like Depot Agreement Price List / RC prices etc. and after its approval, circulate the approved Price List to the concerned Area/projects. This list may be different from the Depot Agreement price list to the extent that the Price List under Spares Cost Cap will be comprehensive one including all bought out items, oils and lubricants etc. whereas the Depot Agreement Price List normally excludes these items. The approved Price List will be valid at least for a period of one year from its applicable date. If any item appears in this Price List as well as in the Depot Agreement Price List / RC price list / any other approved Price List of the same firm for other equipment, the lowest price will be applicable against all such lists. The time period for such circulation of approved Price List shall be about 3 months prior to the 2nd year of operation of the first equipment commissioned. In case of delay in circulation of the approved Price List, the Supplier may continue to supply the items as per the Price List submitted to Subsidiary of CIL (Tender Inviting Authority) but these provisional rates will be regularized subsequently when the approved Price List is circulated.

iv) For subsequent years during the contract period, the supplier may continue with the same approved Price List or submit the next Price List (in hard copy duly signed as well as in soft copy) which may include items with alternate part nos., if any. However, no new item shall be included. If a new Price List is submitted, it should be submitted at least 6 months prior to the applicable year of operation of the first equipment commissioned to CIL along with the statement of increase / decrease in item-wise prices from the previous approved price list with proper justification for increase in prices. Subsidiaries of CIL shall examine the same especially in relation to the increase with the previous year etc. and after its approval, circulate the approved Price List to the concerned subsidiary HQ and mines/projects. The time period for circulation of approved Price List shall be approximately within 3 months after receipt of the new Price List. In case of delay in circulation of the approved Price List, the Supplier may continue to supply the items as per the previous approved Price List in operation but these provisional rates will be regularized subsequently when the approved Price List is circulated by CIL.

    Further, if for the compliance of any statutory, regulatory or environmental regulation or guidelines from DGMS or other institutions / GOI, the new parts for compliance of such regulations may be included in the price list with documentary evidence related to implementation of such guidelines. Otherwise, no items will be included.

v) For items, which are not covered in the approved Price List(s), but need to be supplied, the supplier shall supply the same free of cost during the complete period of contract.

vi) The Supplier will assess the requirement of spares and consumables for the particular year of operation and submit the list of spares and consumables including quantity to the Excavation Engineer In-Charge of the Mine/Project, 3 months in advance of the respective year of operation. The Excavation Engineer In-Charge, after verifying that the same is in order, shall send the same to the Excavation Engineer In-Charge of the Area. The Area, shall proceed to place an Open Provisional Purchase Order, based on the prices as per available Price List, through the Area Purchase Cell on the Supplier within the Spares Cost Cap Value of the particular year. For placing the Open Provisional Purchase Order by the Area Purchase Cell, no formal approval is required. If any item is not appearing in the Price List, it will be supplied on FOC basis.

vii) Once the Open Provisional Purchase Order is placed by the concerned Area Purchase Cell, it is the responsibility of the Supplier to ensure that these spares and consumables are made available to the mine / project as and when required.

viii) Fortnightly Inspection Report(s) regarding the health of the equipment including all safety features etc. will be prepared jointly by the Supplier and the Excavation Engineer-In-Charge of the Mine/Project for short term and long term planning for requirement of spares and consumables and these joint Inspection Reports will be the basis for assessment and confirmation of requirement of spares and consumables under Spares Cost Cap.

ix) Based on the requirement generated as per the fortnightly Inspection Report(s), the Area Excavation Engineer-in-Charge will send to the Area Purchase Cell, the complete details of those spares and consumables against the Open Provisional Purchase Order, which are required for the month/quarter depending on the nature of equipment. The Area Purchase Cell shall thereafter proceed to place Formal Order on the Supplier within 10 days with the concurrence of Area Finance and approval of Area GM. In case the items are not covered in the Open Provisional Purchase Order but the prices are indicated in the approved Price List, the same may also be taken into consideration as long as the limit for Spares Cost Cap is not exceeded. The delivery of the spares and consumables to the Regional/Area Stores shall be made thereafter within 15 days. The materials shall be routed through Regional/Area Stores of the concerned Area (not unit stores / charged off stores). The procedure for acceptance of materials, lifting of materials from Stores, use in the machine and payment to be made shall be as follows:

   a) The supplier will supply the requisitioned spares and consumables along with copies of GST Invoices, delivery challans etc. to the Consignee duly indicating part no. description, quantity etc.

   b) The Regional/Area Stores will enter the receipt of the items in the concerned register and arrange for inspection of the items by the concerned Area Engineer(s) or his authorized representative(s). On acceptance of the material, the Stores Receipt Voucher (SRV) will be raised by the Regional/Area Stores. The materials will then be moved from the Receipt Section to the Issue Section.

   c) Based on requisition from the concerned Mine/Project Engineer(s), the Regional/Area Stores will issue the materials and complete the paper formalities for issue of the items.

   d) Once the materials have been issued, the concerned Mine/Project shall keep record of the same when the material is used on the machine. All concerned details shall be recorded in a register (which may be in electronic form) to be maintained by the Excavation Engineer In-charge of the Mine/Project.

   e) The Regional/Area Stores after issuance of SRV, shall send a copy of the SRV and other related documents like invoices, guarantee/warranty certificate etc. to the Area Finance dept. for payment purposes. A copy of the same will also be sent to the concerned Area Excavation Dept. for maintaining the records in respect of Spares Cost Cap value.

   f) The Finance dept. at the Area will then verify the documents and thereafter send the same to the Paying Authority of the concerned subsidiary for payment. Once the payment is made, the Excavation dept. at the subsidiary / area / mine /project will be informed so that the equivalent amount may be reduced from Spares Cost Cap value for the particular year.

x) The unutilized Spares Cost Cap value for each year will be carried forward to the subsequent year till completion of contract. However, the unutilized value of Spares Cost Cap, if any, at the end of the contract, will lapse.

xi) In case of total value of spares and consumables for a particular year exceeding the Spares Cost Cap of a particular year, the additional spares and consumables shall have

to be supplied on FOC basis. The procedure for accounting and maintenance of records to be followed for FOC supplies will also be the same as above.

In case the working hours of the equipment cross more than 10% of maximum expected working hours ……(Expected working hours is X+500 and maximum working hour is X+500) .in 2nd year to 9th year, i.e. (X+500) +10% of (X+500), the cost cap value of immediate succeeding year may be utilized in the immediate preceding year to the extent of 10% value of the succeeding year for the purpose of overhaul of major assemblies. However, payment of such cost of spares and consumables shall only be paid in the subsequent year.

(*Note # The value of 'X' is indicated in annexure-I*)

xii) The supplier shall stock & maintain sufficient inventory of spares and consumables, required for all kinds of maintenance and repairs of equipment during complete contract period.

xiii) The payment during the relevant year of operation shall be made as per the prevailing approved price list for Spares Cost Cap only. The payment by the Paying Authority of the concerned subsidiary shall be made within 21 days of receipt and acceptance of materials at Regional/Area Stores and after receipt of documents stipulated in the SCC.

xiv) Statement of consumption of spares and consumables with quantity and value for each month of the respective year of the Spares Cost Cap, shall be signed by the Mine/Project Excavation Engineer-In-Charge and the concerned representative of the Supplier. It shall be maintained by the Mine/Project and a copy of the same shall be sent to Excavation Engineer-In-Charge of the Area and Subsidiary HQ. The annual report of the consumption shall be maintained by the Excavation Engineer-In-charge of the Subsidiary HQ.

C.6.2.2 In the event that the spare parts and consumables, as recommended by the Supplier, in any way fall short of actual requirements during the period for which they are said to be adequate, the supplier shall provide such additional spare parts and consumables as are necessary at the final destination. Such additional spare parts and consumables shall be provided by the Supplier to the Purchaser beyond the Spares Cost Cap value free of all cost and shall be transported to Site by air freight internationally and by air, rail or fast road transport within India.

C.6.2.3 In the event that the spare parts, Insurance items and consumables, as recommended by the Supplier, are in excess of actual requirements, the Purchaser will require the Supplier to repossess or repatriate or otherwise dispose of such excess spare parts and consumables in exchange for payment to the Purchaser of the Contract landed Price (with taxes and duties) of the spare parts and Consumables concerned.

The Purchaser shall notify the Supplier, in writing of its requirements under this Clause within thirty (30) days of completion of the contract period referred to in Clause C.6.2.1 hereof.

C.6.2.4 In the event that operation of the equipment is inhibited or frustrated as a direct result of lack of spare parts and consumables, pursuant to Clause C.6.2.2 hereof, then the period referred to in Clause C.6.2.1 hereof shall be extended by a period of not less than the period during which operation as aforesaid was inhibited or frustrated.

C.6.2.5 The supplier shall not be liable for the supply of additional spare parts and consumables, nor to extend the period referred to in Clause C.6.2.1 hereof, if and to the extent that, additional

Spare Parts and Consumables are required by reason of unforeseen accidents, negligence or misuse on the part of the Purchaser or actual working hour exceeds the total expected hours as mentioned in clause C.6.2.6.

C.6.2.6 The assessment of the Supplier of the spare parts requirements shall be based upon the expected working hours per year as defined in the individual Equipment Specifications included in the Technical Specifications.

In accordance with the provisions of performance guarantee clause, Part - D of the technical specifications the expected working hours per annum of the equipment is as per Annexure-1). The expected working 'X' hours per annum as indicated are only approximate hours and may vary (+/-) 500 hours.

Total duration of contract will be as per annexure-1, irrespective of working hour.

In case, actual working hours of each dumper exceeds 10 % of the expected working hours cumulatively of contract period, then only consumable items (as declared by the bidder in (the offer/ Spares Cost Cap) will be procured by the purchaser from the Supplier.

C.6.3 Emergency Spare Parts

C.6.3.1 Emergency spare parts required by the Purchaser to repair breakdowns shall be dispatched to the site by the Supplier by the fastest, practicable means as directed from time to time by the Purchaser.

C.6.3.2 For the purpose of Clause C.6.2.6, "Emergency Spare Parts" shall mean those spare parts or components required by the Purchaser to repair any item of Equipment supplied pursuant to the Contract in the event of a breakdown not attributable to a failure covered by guarantee or a failure of the Supplier to provide adequate Spare Parts or Consumables.

C.6.3.3 Payment in respect of the supply and delivery of such Emergency Spare Parts shall be made promptly, retrospectively, by the Purchaser, in a manner consistent with the terms of payment described in the contract.

C.6.3.4 Lifetime Spare Parts

The Supplier undertakes and guarantees to produce and maintain stocks, to be available for purchase by the Purchaser under separate agreement, of all Spare Parts and Consumables as may be required for maintenance and repair of the Equipment throughout its working life. In the event that the Supplier wishes to terminate production of such Spare Parts, the Supplier shall:

(a) give not less than six months' notice in writing of its intention to terminate production in order to permit the Purchaser reasonable time in which to procure needed requirements; and

(b) immediately following termination, provide to the Purchaser at no cost, manufacturing drawings, material specifications and all necessary permissions to facilitate manufacture of the Spare Parts elsewhere.

(c) any change in part number or superseded part number should be informed to the HOD of Excavation department / MM department of subsidiary hqrs. and the project site wherever the equipment is operating.

In any event, the Supplier shall not seek to terminate manufacture of spare parts for a period of not less than 15 years from taking over or the life time of the equipment whichever is later.

C.6.4 Oils, Lubricants and Fluids

The Supplier shall provide to the Purchaser a detailed schedule of all necessary oils, lubricants, fluids for the operation and maintenance of Equipment. The schedule shall indicate estimated annual consumption and specify the appropriate international standard number **and** the name and reference number of an equivalent available in India considered to be acceptable by the Supplier

C.6.5 General

C.6.5.1 Nothing in this Clause C.6 shall relieve the Supplier of any Guarantee, Availability, Performance o r other obligations or liabilities under this Contract.

C 7 Guaranteed Availability Provisions

Equipment	Minimum Annual Guaranteed Percentage Availability		

C.7.1 Introduction

C.7.1.1 The Supplier shall guarantee that the Equipment supplied pursuant to this Contract shall be available for use by the Purchaser and shall meet the performance criteria specifications at the level and in accordance with the terms and conditions of the Availability Guarantee herein contained.

C7.1.2 Where Equipment supplied under the Contract fails to meet the criteria of the Availability Guarantee, the Supplier shall, at its own cost, provide suitably qualified and experienced personnel at Site to demonstrate to the Purchaser's satisfaction that the required level of availability can be achieved and maintained.

C.7.1.3 The Supplier shall provide the Services of such personnel at Site within seven (7) days of notification by the Purchaser that the availability criteria have not been met in any one (1) month.

C.7.2 Guarantee

C.7.2.1 The Supplier shall guarantee that the Equipment supplied pursuant to the Contract shall be available to the Purchaser at the level hereinafter defined to perform to criteria of not less than that defined in the Technical Specifications incorporated in the Contract.

C.7.2.2 The Supplier shall guarantee that the Equipment shall be available to perform its duty to minimum criteria and to the minimum availability percentage level as defined in the individual Equipment specifications included in the Technical Specifications.

The method of assessment applied shall be as follows:

Method of Assessment:

The following calculation shall determine the availability of the Equipment:

$$\%\text{Availability} = \frac{\text{Scheduled Available Time - Downtime}}{\text{Scheduled Available Time}} \times 100$$

Scheduled Available Time shall equate to 24 hours daily.

Downtime:-

Downtime shall mean all hours of work lost due to mechanical, electrical or other failure, including:

a) routine servicing and maintenance in accordance with the manufacturer's published recommendations, including :
Changing oils, oil filters and air filters; lubrication; changing identified consumable or wear parts.

b) planned preventative maintenance programs;

It shall not however include:

I damage due to abusive use or incorrect operation methods by the purchaser;
I. accidents;
II. strikes or stoppage of work by the Purchaser's personnel;
III. natural disaster;
IV. lack of Spare Parts not attributable to a failure of the Supplier.

Downtime shall also specifically include all hours lost due to failures determined to be guarantee failures in such cases, repair/ replacement will be carried by the supplier for which cost will be borne by subsidiary company and separate work order will be released.

For major repair / planned overhauling / major breakdown including repair of major assemblies / sub-assemblies & re-commissioning of equipment which shall go under breakdown / under major repair head in supplier account, the supplier shall repair / overhaul / replacement of failed assemblies within 21 days at no cost to purchaser and no manpower for such failure / breakdown shall be provided by purchaser for rectification / mounting / demounting /repair etc. Crane with operator shall be provided by the purchaser

The Supplier shall provide a schedule of maintenance required to carry out (a) and (b) above for the contract period of operation and shall state the number of hours required to carry out each maintenance task. The time stated shall, with the agreement of the Purchaser, form the basis of the assessment of the availability.

This schedule of tasks and time will be reviewed periodically by the Purchaser and the supplier, jointly, to monitor the practicality of the schedule.

The Purchaser will assist the Supplier, without relieving the Supplier of any other obligations under the Contract, to achieve the guaranteed availability by:

1. Providing normal and proper maintenance, including preventative maintenance in accordance with the Supplier's standard/published recommendations, and making all necessary repairs using only spare parts provided by the Supplier in accordance with the requirements specified in part C6.
2. Providing co-operation to all Suppliers' authorized representatives, complying with all reasonable procedural suggestions to improve efficiency of machine operation or reduce downtime.
3. Where appropriate, providing and maintaining such conditions as:
   - Proper Electrical Supply
   - Terrain Area
   - Bench Preparation
   - Reasonable Floor Conditions
4. Providing all Suppliers' authorized representatives access at all reasonable times to the machine service and repair facilities.

5. Maintaining a logbook for each shift wherein the working hours, breakdown hours, maintenance hours, idle hours, etc. shall be recorded. This record will be available for examination and signature by the Supplier's representative.

C.7.2.3 Equipment may be transferred from consignee area/ project to other area / project within the subsidiary or any other subsidiary of CIL, if required. In such cases the supplier shall extend the full support and supervision in dismantling of equipment and subsequent commissioning at new site. The cost of dismantle, transport and assembling shall be borne by CIL or its subsidiary. However, the contract shall remain in force till completion of the contract period at new location

C.7.3 Effect and Duration of Guarantee

C.7.3.1 This Guarantee shall become effective on the day on which the Equipment is commissioned at the Site. Commissioning shall be evidenced by the issue of the Purchaser's Acceptance Certificate.

C.7.3.2 This guarantee shall remain effective for the entire contract period from the date of commissioning irrespective of the hours operated by the Equipment during the period of the guarantee.

C.7.3.3 Compensation for not achieving guaranteed Availability

In the event that Equipment fails to achieve the Availability herein provided, measured over each twelve (12) month period, the Supplier shall be liable for and pay to the Purchaser, as liquidated damages, a sum equal to as indicated hereunder for each equipment against the PBG/ extended SDBG / bills submitted by the bidder as per clause-2 of SCC

a) 1% of the delivered landed price of the equipment including the Spares Cost Cap for the year in which the machine could not achieve guaranteed availability for reduction in every percentage or part thereof from the Guaranteed Availability for the first 5%.
b) 10% of the delivered landed price of the equipment including the Spares Cost Cap for the year in which the machine could not achieve guaranteed availability for reduction beyond 5% from the guaranteed availability.

c) Whenever deductions for unsatisfactory performance of equipment are made within the tenure of the PBG/extended SDBG/amount held back as PBG, the amount deducted, from the PBG/extended SDBG/amount held back as PBG, should be replenished within a month in order to ensure that the original value, of the PBG/extended SDBG/amount held back as PBG, remains the same throughout the contract period

C.8 Deemed Breakdown

When the supplier is unable to supply the replacement of a failed part during the contract period, and if the machine is commissioned by using the spares and consumables from the stock of the project, the period after 21 days till the supplier replaces the part shall be treated as 'deemed breakdown' (the credit for keeping machine available shall not be given to the supplier.)

The supplier shall not in any way be allowed to take out spare parts and consumables from other equipment, which are under breakdown and covered within the scope of this contract. However, Subsidiary company, in the interest of work, reserves the right to advise the supplier to commission the breakdown equipment covered under this contract by taking out **spare** parts and consumables from other breakdown equipment/ available at subsidiary **company.**

Nevertheless, during this period also, the equipment shall be treated as 'deemed breakdown' till the supplier replaces the spare parts/provide the consumables.

C.9 Composite-warranty/guarantee

The supplier shall warrant that the equipment supplied under this contract is:

a) In accordance with the contract specifications.
b) The equipment shall have no defects arising out of design, material or workmanship & the complete equipment shall be warranted for 12 months from the date of commissioning. Any defect arising observed on this account will have to be attended immediately.
c) The supplier must ensure that there is no major breakdown due to manufacturing / design defects during the warranty period. In case such breakdown occurs, the purchaser reserves the right to extend the warranty period suitably.

The warranty shall cover for total equipment so that comprehensive responsibility lies only with the equipment supplier although components may be supplied by different suppliers to the bidder.

C.10 Quality Assurance

C.10.1 The Supplier should furnish in detail its quality assurance plan for various stages of manufacture. The quality assurance plan shall be of the manufacturing plant where the bidder proposes to manufacture the equipment. The Quality Assurance plan shall comply with an internationally recognized quality assurance standard such as ISO 9000 or its equivalent.

C.10.2 The Supplier shall provide facilities to Purchaser or their authorized representatives for progress inspection during manufacture at his works and furnish all test data available in this regard for quality control, both for bought-out items and his own manufactured items.

C.10.3 The Purchaser or its authorized representative, when so required by him, shall also be provided with samples of "bought-out" materials for the purposes of undertaking independent tests, which independent tests shall be at the expense of the Purchaser.

Annexure-I

SL NO.	*EQUIPMENT*	*CAPACITY*	*LIFE IN YEARS (NORM)*	LIFE IN HOURS (NORM)	**'X'** (EXPECTED ANNUAL WORKING HOURS)	COST CAP CONTRACT PERIOD INCLUDING 01 YEAR WARRANTY (Years)
1	*DUMPER*	100 T	9	24000	4500	7
2		60 T	8	20000	4500	6
3	WATER SPRINKLER	70 KL	12	18000	3000	5
4		28KL	10	14000	3000	4
5	HYD EXCAVATOR	5.5-6.5 Cum(FS)	9	28000	5000	7
6		5-6 Cum(BH)	9	28000	5000	7
7		3.8 Cum (BH)	8	25000	5000	6
8		1.5 Cum (BH)	8	18000	4500	3
9	SURFACE MINER	3800 MM	9	32000	5000	2+5
10	FRONT END LOADER					
11		6-7 Cum	9	20000	5000	5
12	DOZER	410 HP	9	16000	4000	5
13		320 HP	9	16000	4000	4
14	DRILL	250 MM	10	20000	3000	4
15		160 MM	9	14000	3000	1(No cost cap)
16	GRADER	550HP	10	14000	3000	5
17		280HP	9	10000	3000	5
18	CRANE	10T	9	-		1 (No cost cap)
19		20T	9	-		1 (No cost cap)
20		30T	9	-		1 (No cost cap)
21		40T	10	-		1 (No cost cap)
22		50T	10	-		1 (No cost cap)
23		75T	12	-		1 (No cost cap)
24	TYRE HANDLER	UPTO 40 X57	10	-		1 (No cost cap)
25		UPTO 33X51	10	-		1 (No cost cap)

PART- D

(EQUIPMENT SPECIFICATION)

List of Equipment

DUMPER

1. 100 T (Rock body and Coal body)
2. 60 T (Rock body and Coal body)

WATER SPRINKLER

1. 70 KL Water Sprinkler
2. 28 KL Water Sprinkler

HYDRAULIC EXCAVATOR

1. Hydraulic excavator of bucket capacity 5.5 – 6.5 Cum with loading shovel attachment
2. Hydraulic excavator of bucket capacity 5.0 – 6.0 Cum with backhoe attachment
3. Hydraulic excavator of bucket capacity 3.8 Cum with backhoe attachment
4. Hydraulic excavator of bucket capacity 1.5 Cum with backhoe attachment

FRONT END WHEEL LOADER

1. Front End Wheel loader of bucket capacity 6-7 Cum

BULL DOZER

1. 410 HP
2. 320 HP

BLAST HOLE DRILL

1. 160 MM
2. 250 MM

MOTOR GRADER

1. 280 HP

CRANE

1. RT Crane 75 T
2. RT Crane 50 T
3. RT Crane 40 T
4. RT Crane 30T
5. RT Crane 20T
6. Mobile Crane(Pick and carry) -10 T
7. Tyre handler for handling OTR tires of size ; 18 x 25 ~ 40 x 57
8. Tyre handler for handling OTR tires of size ; 18 x 25 ~ 33 x 51

SURFACE MINER

1. Drum width 3800 MM

100T REAR DUMPER

EQUIPMENT SPECIFICATION OF 100 TON REAR DUMPER

[Payload Range 100T – 110T]

1. Scope of specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, self-propelled, Wheeled, Rock Body / Coal Body, Rear Dumper having payload range of 100 Ton to 110Ton.

Note: If the offered capacity is in fraction, then the fraction equal to or more than 0.5 will be taken as 1 (one) and less than 0.5 will be considered as zero. (1 Ton = 0.907185 Tonne)

2. References:

The following International Standards as per latest amendment are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards, if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO Ref.	Description
ISO 2867	Earth-moving machinery - Access system.
ISO 3450	Earth-moving machinery - Wheeled machines - Performance requirements and test procedures for braking systems.
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications.
ISO 3471	Earth-moving machinery - Roll-Over Protective Structures - Laboratory tests and performance requirements.
ISO 5010	Earth-moving machinery - Rubber Tyres Machines - Steering requirements.
ISO 6014	Earth-moving machinery - Determination of ground speed.
ISO 6405-1	Earth-moving machinery - Symbols for operator controls and other displays - Part 1 Common symbols.
ISO 6405-2	Earth-moving machinery - Symbols for operator controls and other displays - Part 2 Specific symbols for machines, equipment and accessories.
ISO 6483	Earth-moving machinery - Dumper bodies - Volumetric rating.
ISO 6682	Earth-moving machinery - Zones of comfort and reach for control.
ISO 6750-1	Earth-moving machinery - Operation and maintenance – Contents & Formats
ISO 6750-2	Earth-moving machinery - Operation and maintenance – Operator's Manual-Part 2: List of references

ISO 7132	Earth-moving machinery - Dumpers - Terminology and commercial specifications
ISO 7457	Earth-moving machinery - Measurement of turning dimensions of wheeled machines.
ISO 9249	Earth-moving machinery – Engine test code – Net power.
ISO 10268	Earth-moving machinery – Retarders for dumpers – performance tests
ISO 10968	Earth-moving machinery – Operator's control.
ISO 7000 / IEC 60417	Graphical symbols for use on equipment.
Other ISO standards mentioned in the specification of individual system of the equipment	

3. Design Criteria

The dumper shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The dumper shall be suitable for loading by 10-12 CuM Hydraulic Shovel , 10 CuM ER Shovel or 10-12 CuM FEL with rock / coal, having average density of 1,800 kg per m^3 / 1150 kg per m^3 after blasting.

4. Technical requirements:

4.1 Engine:

The dumper shall be powered by a direct injection 4-stroke Diesel Engine of not less than 690 kW net power measured between 1700 and 2200 r/min according to ISO 9249. The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier II or equivalent or above standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of tender.Certificate for minimum EPA Tier II or equivalent or above from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 10 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 Drive system:

The drive system shall be mechanical with power shift transmission.

4.2.1 Transmission

The dumper shall be provided with an off-highway electronically controlled automatic power shift hydraulic transmission/heavy duty double reduction planetary gear system with lock-up clutch and downshift/reverse inhibitors, engine over speed protection, body up shift limiter. A suitable arrangement of individual modulation for maximum smoothness in all gearshift is to be provided. The electronic control shall have built in diagnostics features with suitable memory capacity. Suitable protection of the transmission pan from external damage should be provided. The pan guard / suitable protection should be designed to minimize accumulation of dirt and debris.

4.2.2 Propel and final drive

A dynamically balanced propel shaft with universal joints at both ends should be utilized for power transmission. Adequate means should be provided to prevent damage to other components in the event of failure of the universal joints.

The final drive shall comprise of a heavy-duty differential with high quality spiral bevel gear and pinions and a heavy-duty planetary gear system and drive axle.

4.3 Suspension:

Suitable (hydra-air) independent front and rear gas over oil suspension shall be provided to absorb road shocks and prolong chassis & tire life.

4.4 Steering:

Full hydraulic orbitrol power steering and emergency steering, which complies with latest ISO 5010, shall be provided. Emergency steering shall be automatically activated in the event of failure of the normal steering power source. Suitable steering locking arrangement is to be provided to prevent untoward movement of steering wheel and tyre during working below the cabin and engine is running.

4.5 Hoses:

All hoses shall be grouped as far as possible and suitably clipped with fibre clamps wherever possible, to lessen damage from scuffing. Fire resistant/ fire retarder/ heat resistant hydraulic hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.6 Brakes:

Suitable reliable Service, Secondary (Emergency) and Parking Brakes which comply with latest ISO 3450, shall be provided.

4.6.1 Service Brakes:

The front service brakes shall be air and / or hydraulic actuated caliper/disc type and should operate automatically in the event of low air/oil pressure.

The rear service brakes shall be air and / or hydraulic actuated oil cooled multiple disc type / hydraulic disc type / caliper type and should operate automatically in the event of low air / oil pressure.

They shall be fully enclosed to prevent entry of dust & water and designed for low maintenance.

4.6.2 Secondary Brakes (Emergency Brakes):

Provision of Automatic Emergency Brake along with manual Emergency Braking system, which shall be operative in the event of failure of Service Brake, shall be provided.

4.6.3 Parking Brakes:

Parking brakes shall be oil cooled spring applied, hydraulically released, apply to rear wheels, inbuilt in rear brake group and should be operational even at zero system pressure.

The parking brake system shall have suitable interlocking arrangement with Drive System to prevent movement of the dumper when parking brake is engaged.

The parking brakes should be operational even at zero system pressure.

4.7 Retarder:

Both Automatic and manual retarding control system to control speed while descending grades shall be provided.

4.8 Tyres:

Tyre Tubeless, rock duty, cut resistant, E 4 type tyres size 27.00-49 of suitable TKPH rating to match the operational condition.

4.9 Frame:

The frame should be rugged durable construction of high strength steel and free from any stress concentration. The design must take care of all forces encountered during the operation of the dumper.

4.10 Dump Body:

a. Rock Body:

The dump body shall be dual slope rock body having pay load capacity 90,800 kg to 1,00,000 kg based upon 2:1 heap loading of rock having a density after blasting of 1800kg/CuM. The dump body shall be exhaust heated (excluding the extended canopy portion), heavy duty type with high hardness, abrasion resistant sides, front and bottom plates. The width of the body shall be such that it protrudes over the tyres to prevent damage due to spillage of material from the body. Also the canopy portion should be so extended so that it not only covers the cabin but also the front radiator to prevent damage due to spillage of material from the body

The volume of the body shall be such that it can accommodate 5 pass loads from 10 CuM Shovel (minimum 47 CuM struck capacity) without spillage. The body design shall be such that the stability of the dumper is maintained in all operating conditions especially during turning.

The body position indicator shall be provided in operator's cabin and shall comply as per requirement of DGMS circular no 06 of 2020 Dhanbad dated 27.02.2020.

Rock and Coal body shall be interchangeable.

b. Coal Body:

The dump body capacity shall be between 90,800 kg to 1,00,000 kg payload based upon 2:1 heap loading of coal having a density after blasting of 1150 kg/cum. The dump body shall be suitable for coal transportation (Coal density as mentioned in clause 3) and heavy-duty type with high hardness abrasion resistant side, front and bottom plates.
The width of the body shall be such that it protrudes over the tyres to prevent damage due to spillage of material from the body. Also the canopy portion should be so extended so that it not only covers the cabin but also the front radiator to prevent damage due to spillage of material from the body
Exhaust should be through suitable muffler type complying relevant guidelines of noise level. The volume of the body shall be such that it can accommodate adequate pass loads from 10 CuM Excavator (Minimum 80 cum Struck capacity) without spillage and body design shall be such that the stability of the machine is maintained in all operating conditions especially during turning.

A body position indicator with visual alarm shall be provided in operator's cabin. Should comply as per requirement of Clause-6 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020.

Rock and Coal body shall be interchangeable.

4.11 Fuel Tank:

The fuel tank shall be of sufficient capacity to allow 16 hours operation without refueling and be provided with a level indicator and lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Lubrication System:

A centralized PLC/ microprocessor / micro controller based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

4.13 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high-pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.14 Fire Extinguisher:

A fire extinguisher shall be provided on the dumper, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the

time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) Circular No.02 dtd. 08thJuly2013**.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.15 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.15.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.15.2 Operator's Protective Structures:

Dumper shall be equipped with a roll-over protective structure (ROPS). The ROPS shall comply with ISO 3471. Also, FOPS shall be provided as per ISO –ISO3449

4.15.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be provided and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.15.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.15.5 Starting and Stopping System:

Dumper shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.16 Gauges and Indicators/Electronic Display:

The following shall be provided:

a. Water temperature gauge
b. Air cleaner vacuum gauge
c. Engine oil pressure gauge
d. Converter oil temperature gauge/indicator (where applicable)
e. Fuel capacity gauge
f. Engine tachometer
g. Engine hour meter

h. Speedometer
i. Air pressure gauge (if applicable)
j. Voltmeter (where applicable)
k. Hydraulic Oil Temperature Gauge

4.17 Warning Alarms/Lights/Indicators:

Warning systems shall be provided for the following:

a. Reversing –DGMS complied Audio Visual Alarm (Type confirming to Specifications as per DGMS (Approval)/ AVA/01 dated 25-05-2010 of DGMS)
b. Parking Brake actuation
c. High torque converter oil temperature (where applicable)
d. Low engine oil pressure
e. High coolant temperature
f. Low air pressure (where applicable)
g. Emergency steering
i. Indicator light for retarding, over speed & service brakes
j. Dumping buzzer
l. Warning alarms in case of failure of automatic lubrication system.
m. Tyre pressure monitoring system in cabin to be incorporated.

4.18 Engine Electrical System:

The dumper shall be provided with the following:

a. 24V DC electrical system with suitably rated alternator of reputed make
b. Electrical starter motor of reputable make
c. High capacity maintenance free batteries of reputed make
d. Battery isolation switch/ Relay

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance.

4.19 Lighting:

Adequate lighting shall be provided for safe night shift operation. All lighting system shall be LED which include the following:

a. 4 nos. LED Headlight
b. Stop and tail LED lights
c. Hazard and Turn signal lights (left and right) on both front and rear LED type
d. Fog lamps 2 nos.
e. Backup lights 2 nos.

f. Cabin Dome & Ladder lights
g. Service light in rear axle & under hood (Wherever applicable)
h. Manual/ Auto backup light

4.20 Guards and shields:

Adequate guards and shields, which comply with ISO 3457, shall be provided on the dumper.

5. Safety Features:

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment.

a. Mechanical steering locking device to prevent untoward movement of steering wheel and tyre while persons are working underneath the cabin when engine is ON.
b. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot shall be provided.
c. **Proximity Warning Device** - Should comply as per requirement of Clause 14 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
d. Mechanical Device to avoid head to Tail Collision of Dumpers: - Should comply as per requirement of **Clause 4** of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
The manufacturers should submit a self-certificate explicitly stating that any one of the features fitted in the Dumper shall provide additional protection to the operator and it shall not affect the normal operation of the Dumper on the gradients and its steerability, loading or dumping operations.
e. Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in whichcable/wire are laid shall be of fire resistant /fire retarder type.
f. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
g. Methodology/ facility to be provided in the dumper to restrict/ control the speed as determined by management.
h. Propeller shaft guard (Wherever applicable).
i. Mirrors, right and left.
j. Hot zones shall be separated from cold zone by providing suitable arrangement.
k. Exhaust pipes and turbocharger shall be adequately guarded.
l. Load Indicator- Should comply as per requirement of Clause 8 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
m. Dump Body raised position indicator with warning- Should comply as per requirement of Clause-6 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
n. Safety provision for holding the dump body in hoist condition.
o. Manual wheel stopper while parking dumper in gradient.

p. Auto dipping system - Should comply as per requirement of Clause -3 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

q. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

r. Retro reflective reflectors on all sides for visibility of truck during night

s. Cabin Guard Extension – Canopy shall cover the operator's cabin fully.

t. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

6. Ancillary Equipment and other requirements:

The following shall be provided on the dumper:

a) Front and rear tow hooks.
b) Pressurized radiator cap with chain attachment.
c) Headlight high beam indicator
d) Cab protection spill guard
e) Water separators in air lines (Where applicable)
f) Rock ejector bar/chains between each set of dual rear wheels
g) Suitable on-board payload monitoring system with a feature to store & retrieve data of at least one month
h) Self-diagnostic and real time monitoring electronic tool
i) Tyre inflation kit.

7. Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

(i) Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
(ii) Maximum speed, average speed, distance travelled, waiting time, loading time, unloading time, load carried by dumper for each trip and cumulative.
(iii) Engine oil pressure or temperature
(iv) Coolant temperature
(v) Coolant level
(vi) Engine RPM
(vii) Fuel level and fuel consumption rate
(viii) Hyd. oil temperature
(ix) Engine electrical system - Battery voltage and Alternator out put
(x) All vital parameters of drive system including transmission Fault codes along with details
(xi) Tyre inflation pressure & temperature

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Dumper Operators and control room person for the following events:

a) In the case of operator exceeds pre-defined maximum speed.
b) In the event of dumpers travelling in opposite direction falls in line.
c) To maintain safe distance between dumpers travelling in the same direction.
d) Fire warning to operator in case of catching fire.
e) Dump Body hoist indication to be given in the event of dumper travelling in dump body hoist position.

The supplier shall provide the following:

A. There has to be one integrated single online port for capturing all the vital data.
B. The real time interface telemetry port will be provided in the equipment
C. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
D. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
E. There shall be integrated on board data management system as explained at point no.3 as above.
F. Permission to third party for interfacing, data collection through online port.
G. Signing of Non-disclosure agreement to protect intellectual property right on either side.
H. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
I. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

8. Special Guarantees

The following guarantee will apply for the different components from the accepted date of commissioning.

a. Body, Chassis – 10,000 hours
b. Complete Engine system- 8000 hours
c. Transmission Assembly (where applicable) - 8000 hours
d. Differential / Final drive (where applicable) - 8000 hours
e. Disc Brake - 8000 hours
f. OTR tyre - 4500 hours or 12 months first life before re-treading

In case any tyre is found to be defective/failure in the period of special guarantee, joint inspection shall be made by representative of Subsidiary company & equipment supplier. Then equipment supplier shall replace the defective tyre with a new tyre of same type and size

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

In case of any failure of the above sub-assemblies except tyres beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. However In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser.

9. Performance Guarantee:

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum is 4500 (four thousand five hundred) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty- percent) annually for a period of 36 months from the date of accepted date of commissioning, and 80% (Seventy Five percent) annually for following years of the contract period.

[Note – If necessary, expected annual working hours and guaranteed availability may be changed by the subsidiary company as per actual requirement]

10. Expected life of major assemblies:

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

Equipment	Major Assemblies	Expected Life* (in Hours)
Dumpers	Body Chassis	
	Engine	
	Transmission	
	Differential	
	Final Drive	

Note - * Expected life means life before first overhaul

11. Information to Be Provided by the Bidder

The bidder shall furnish the following information. All technical information shall be in SI units.

11.1 General

a) Number of similar models supplied during the last five (5) years. The information shall be given in the following format and in the order of most recent first:

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of special tools to be provided with the equipment.
c) Details of erection programme for the bid.
d) Details of nearest Depot/Warehouse and Service Facility available for the present offer.

11.2 Technical Details

a) Latest engine performance curves showing net power, net torque and a specific fuel consumption of the installed engine, measures according to ISO 9249.
b) Maximum speed determined according to ISO 6014
c) Latest Rim-pull - Speed - gradeability Curves of the offered model clearly indicating Driving speed fully loaded up 14% effective grade.
d) Latest retarding performance chart of the offered model in accordance with ISO 10268 clearly indicating: Maximum constant speed fully loaded down 10% effective grade.
e) Calculations determining the time for the operating cycle specified in clause 11.3.12.
f) Result of service and secondary brake stopping tests carried out

according to ISO 3450.

Braking system tested	Slope (%)	Machine Speed (km/h)	Stopping distance(m)
Service			
Secondary			

g) Turning diameter in accordance with ISO 7457.
h) Detail technical description of all systems of the dumper.
i) Detail technical description of Electronic Control Module used, its integration with other components of power train, details of data capturing (active, intermittent & calculated) & full feature, Diagnostic Tool's software version, data storage capacity & features and Payload Monitoring System fitted in the Dumper.
j) Layout drawings and detailed technical descriptions of hydraulic systems and components
k) Details of major bought out assemblies and sub-assemblies including manufacturer's name & full address, type, model etc.
l) Comprehensive commercial literature specifications, the content of which must comply with ISO 7132.
m) Operation and Maintenance manuals in accordance with ISO 6750 as indicated in clause A-3 of section VI.
n) Details and layout of Automatic lubricating system.
o) Details and layout of Automatic fire detection and suppression system.
p) Details of rear vision system
q) Details of proximity warning device.
r) Calculations and drawings verifying the body capacity.

11.3 Dimensions, Weights and Performance Details

11.3.1 Dimensions

a. Maximum Overall length (m)
b. Maximum overall width (m)
c. Maximum height without body (m)
d. Maximum height with body (m)
e. Loading height (m)
f. Dump height (m)
g. Discharge height (m)
h. Maximum body depth (m)
i. Body target area [inside length and width at top] (m^2)
j. Wheel base (m)

11.3.2 Weight Distribution

a) Empty vehicle (kg)
Front axle (kg)

Rear axle (kg)
Total (kg)

b) Loaded vehicle (kg) Front axle (kg) Rear axle (kg)
Total (kg)

c) Payload (kg)

11.3.3 Engine

a. Manufacturer and model
b. Number of cylinders
c. Bore (mm)
d. Stroke (mm)
e. Displacement (litre)
f. ISO net power at.....r / min (kW)
g. Maximum torque at .....r/min (Nm)
h. ECM /alternate - make, model & data storage capacity
i. Diagnostic tool's make, model, software version, data storage capacity & features.

11.3.4 Mechanical Drive System)

I Transmission

a) Manufacturer and model
b) Type
c) Number of gear speeds: forward and reverse
d) Travel speeds: forward and reverse

II Differential

a) Manufacturer and model
b) Type
c) Ratio

III Final Drive

a) Manufacturer and model
b) Type
c) Ratio

11.3.5 Suspension

Front
a. Type
b.Stroke
c. Load - deflection rate: loaded and empty
II Rear
a) Type
b) Stroke
c) Load - deflection rate: loaded and empty

11.3.6 Steering

a) Type
b) Emergency steer method

11.3.7 Brakes

11.3.7.1 Service Brake:

I. Front

a. Type
b. Actuating System

II. Rear

a) Type
b) Actuating System

11.3.7.2 Emergency Brakes

a) Type
b) Actuating System

11.3.7.3 Parking brakes

a) Type
b) Actuating System

11.3.8 Retarder

a) Type
b) Actuating System

11.3.9 Tyres

a) Manufacturer
b) Size and type
c) Tread
d) Rim size
e) TKPH

11.3.10 Hydraulic System

a) Make & model, Number, flow rates and operating pressures of pumps
b) Make & model, Number, piston diameters and stroke length of cylinders
c) Relief valve operating pressures

11.3.11 Electrical System

a. Starter make and model
b. Alternator make and model
c. Batteries numbers and rating
d. Lighting details (number, type & rating)

11.3.12 Operating Cycle

The operating cycle, for which the bidder shall provide the information required in clause 11.2 (e), shall be:

Time for hauling, rated payload and returning empty to the place of loading on a haul road of the following profile with a rolling resistance of 2%.

First 1500 meters up a 12% grade, next 200 meters level, next 200 meters up a 10% grade, last 100 meters level.

A fixed time of six (6) minutes for loading and dumping shall be added to this time to calculate the total operating cycle.

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 11. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 11. A detrimental deviation of up to 2½% will be accepted

1	Specific Fuel Consumption for engine	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Pay load Capacity	To be tested at Works / Project Site.
3	Engine Net Power & RPM as per ISO 9249	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
4	Driving Speed - fully loaded up 14% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
5	Retard Speed - fully loaded down 10% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
6	Service Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
7	Secondary Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
8	Turning Dimension as per ISO 7457	To be tested at Works / Project Site.
9	Dump body should accommodate5pass loads from 10 CuM shovel without spillage	To be tested at Project Site.

60T Rear Dumper

PART D: - EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATION OF 60 TON REAR DUMPER

[Payload Range 60T – 65T]

1. Scope of specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, self-propelled, Wheeled, Rock Body/ Coal Body, Rear Dumper having payload range of 60 Ton to 65Ton.

Note: If the offered capacity is in fraction, then the fraction equal to or more than 0.5 will be taken as 1 (one) and less than 0.5 will be considered as zero. (1 Ton = 0.907185 Tonne)

2. References:

The following International Standards as per latest amendment are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO Ref.	Description
ISO 2867	Earth-moving machinery - Access system.
ISO 3450	Earth-moving machinery - Wheeled machines - Performance requirements and test procedures for braking systems.
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications.
ISO 3471	Earth-moving machinery - Roll-Over Protective Structures - Laboratory tests and performance requirements.
ISO 5010	Earth-moving machinery - Rubber Tyres Machines - Steering requirements.
ISO 6014	Earth-moving machinery - Determination of ground speed.
ISO 6405-1	Earth-moving machinery - Symbols for operator controls and other displays - Part 1 Common symbols.
ISO 6405-2	Earth-moving machinery - Symbols for operator controls and other displays - Part 2 Specific symbols for machines, equipment and accessories.
ISO 6483	Earth-moving machinery - Dumper bodies - Volumetric rating.

ISO 6682	Earth-moving machinery - Zones of comfort and reach for control.
ISO 6750-1	Earth-moving machinery - Operation and maintenance – Contents & Formats
ISO 6750-2	Earth-moving machinery - Operation and maintenance – Operator's Manual-Part 2: List of references
ISO 7132	Earth-moving machinery - Dumpers - Terminology and commercial specifications
ISO 7457	Earth-moving machinery - Measurement of turning dimensions of wheeled machines.
ISO 9249	Earth-moving machinery – Engine test code – Net power.
ISO 10268	Earth-moving machinery – Retarders for dumpers – performance tests
ISO 10968	Earth-moving machinery – Operator's control.
ISO 7000 / IEC 60417	Graphical symbols for use on equipment.
Other ISO standards mentioned in the specification of individual system of the equipment	

3. Design Criteria

The dumper shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The dumper shall be suitable for loading by 5-6 CuM Backhoe Hydraulic Shovel, 5.5 -6.5 CuM Face Hydraulic Shovel, 6-7 CuM FEL & 5 CuM ER Shovel with rock /coal having average density of 1,800 kg per m^3 / 1150 kg per m^3 after blasting.

4. Technical requirements:

4.1 Engine:

The dumper shall be powered by a direct injection 4-stroke Diesel Engine of not less than 475 kW net power measured between 1700 and 2200 r/min according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier II or equivalent or above standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of tender .Certificate for minimum EPA Tier II or equivalent or above from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet up to 10 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 Drive system:

The drive system shall be mechanical with power shift transmission.

4.2.1 Transmission

The dumper shall be provided with an off-highway electronically controlled automatic power shift hydraulic transmission/heavy duty double reduction planetary gear system with lock-up clutch and downshift/reverse inhibitors, engine over speed protection, body up shift limiter. A suitable arrangement of individual modulation for maximum smoothness in all gearshift is to be provided. The electronic control shall have built in diagnostics features with suitable memory capacity. Suitable protection of the transmission pan from external damage should be provided. The pan guard/ suitable protection should be designed to minimize accumulation of dirt and debris.

4.2.2 Propel and final drive

A dynamically balanced propel shaft with universal joints at both ends should be utilized for power transmission. Adequate means should be provided to prevent damage to other components in the event of failure of the universal joints.

The final drive shall comprise of a heavy-duty differential with high quality spiral bevel gear and pinions and a heavy-duty planetary gear system and drive axle.

4.3 Suspension:

Suitable (hydra-air) independent front and rear gas over oil suspension shall be provided to absorb road shocks and prolong chassis & tire life.

4.4 Steering:

Full hydraulic orbitrol power steering and emergency steering, which complies with latest ISO 5010, shall be provided. Emergency steering shall be automatically activated in the event of failure of the normal steering power source. Suitable steering locking arrangement is to be provided to prevent untoward movement of steering wheel and tyre during working below the cabin and engine is running.

4.5 Hoses:

All hoses shall be grouped as far as possible and suitably clipped with fiber clamps wherever possible, to lessen damage from scuffing. Fire resistant/ fire retarder/ heat resistant hydraulic hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.6 Brakes:

Suitable reliable Service, Secondary (Emergency) and Parking Brakes which comply with latest ISO 3450, shall be provided.

4.6.1 Service Brakes:

The front service brakes shall be of air and / or hydraulic actuated caliper/disc type and should operate automatically in the event of low air/oil pressure.

The rear service brakes shall be air and / or hydraulic actuated oil cooled multiple disc type and should operate automatically in the event of low air/oil pressure.

They shall be fully enclosed to prevent entry of dust & water and designed for low maintenance.

4.6.2 Secondary Brakes (Emergency Brakes):

Provision of Automatic Emergency Brake along with manual Emergency Braking system, which shall be operative in the event of failure of Service Brake, shall be provided.

4.6.3 Parking Brakes:

The parking brake system shall have suitable interlocking arrangement with Drive System to prevent movement of the dumper when parking brake is engaged.

The parking brakes should be operational even at zero system pressure.

4.7 Retarder:

Both Automatic and manual retarding control system to control speed while descending grades shall be provided.

4.8 Tyres:

Tubeless, rock duty, cut resistant, E 4 Tyre of size 24.00-35 of suitable TKPH rating to match the operational condition.

4.9 Frame:

The frame should be rugged durable construction of high strength steel and free from any stress concentration. The design must take care of all forces encountered during the operation of the dumper.

4.10 Dump Body:

a. Rock Body:

The dump body shall be dual slope rock body having pay load capacity of 60 T -65 T based upon 2:1 heap loading of rock having a density after blasting of 1800kg/CuM. The dump body shall be exhaust heated (excluding the extended canopy portion), heavy duty type with high hardness, abrasion resistant sides, front and bottom plates. The width of the body shall be such that it protrudes over the tyres to prevent damage due to spillage of material from the body. Also the canopy portion should be so extended so that it not only covers the cabin but also the front radiator to prevent damage due to spillage of material from the body

The volume of the body shall be such that it can accommodate 6 pass loads from 5 CuM Shovel and 5 pass loads from 6 CuM Shovel (minimum 28 CuM struck capacity) without spillage. The body design shall be such that the stability of the dumper is maintained in all operating conditions especially during turning.

The body position indicator shall be provided in operator's cabin and shall comply as per requirement of DGMS circular no 06 of 2020 Dhanbad dated 27.02.2020.

Rock and Coal body shall be interchangeable.

b. Coal Body:

The dump body capacity shall be between 60 T -65 T payload based upon 2:1 heap loading of coal having a density after blasting of 1150 kg/cum. The dump body shall be suitable for coal transportation (Coal density as mentioned in clause 3) and heavy-duty type with high hardness abrasion resistant side, front and bottom plates.
The width of the body shall be such that it protrudes over the tyres to prevent damage due to spillage of material from the body. Also the canopy portion should be so extended so that it not only covers the cabin but also the front radiator to prevent damage due to spillage of material from the body

Exhaust should be through suitable muffler type complying relevant guidelines of noise level. The volume of the body shall be such that it can accommodate adequate pass loads from 5-6 CuM Excavator (minimum 40 Cum Struck Capacity) without spillage and body design shall be such that the stability of the machine is maintained in all operating conditions especially during turning.
A body position indicator with visual alarm shall be provided in operator's cabin. Should comply as per requirement of Clause-6 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020.
Rock and Coal body shall be interchangeable.

4.11 Fuel Tank:

The fuel tank shall be of sufficient capacity to allow 16 hours operation without refueling and be provided with a level indicator and a lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Lubrication System:

A centralized PLC/ microprocessor /micro controller based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and may be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

4.13 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.

- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high-pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.
Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.14 Fire Extinguisher:

A fire extinguisher shall be provided on the dumper, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) CircularNo.02 dtd.**

08thJuly2013.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.15 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F. No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.15.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.15.2 Operator's Protective Structures:

Dumper shall be equipped with a roll-over protective structure (ROPS). The ROPS shall comply with ISO 3471. Also, FOPS shall be provided as per ISO -ISO3449

4.15.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be padded and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.15.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.15.5 Starting and Stopping System:

Dumper shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement).

4.16 Gauges and Indicators/Electronic Display:

The following shall be provided: a.Water temperature gauge

a. Air cleaner vacuum gauge
b. Engine oil pressure gauge
c. Converter oil temperature gauge/indicator (where applicable)
d. Fuel capacity gauge
e. Engine tachometer
f. Engine hour meter
g. Speedometer
h. Air pressure gauge (if applicable)
i. Voltmeter (where applicable)
j. Hydraulic Oil Temperature Gauge

4.17 Warning Alarms/Lights/Indicators:

Warning systems shall be provided for the following:

a. Reversing –DGMS complied Audio Visual Alarm (Type confirming to Specifications as per DGMS (Approval)/ AVA/01 dated 25-05-2010 of DGMS)
b. Parking Brake actuation
g. High torque converter oil temperature (where applicable)
h. Low engine oil pressure
i. High coolant temperature
j. Low air pressure (where applicable)
g. Emergency steering
i. Indicator light for retarding, over speed & service brakes
j. Dumping buzzer
k. Warning alarms in case of failure of automatic lubrication system.
l. Tyre pressure monitoring system in cabin to be incorporated.

4.18 Engine Electrical System:

The dumper shall be provided with the following:

a. 24V DC electrical system with suitably rated alternator of reputed make
b. Electrical starter motor of reputable make
c. High capacity maintenance free batteries of reputed make
d. Battery isolation switch/ Relay

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance.

4.19 Lighting:

Adequate lighting shall be provided for safe night shift operation. All lighting system shall be LED which include the following:

a. 4 nos. LED Headlight
b. Stop and tail LED lights
c. Hazard and Turn signal lights (left and right) on both front and rear LED type
d. Fog lamps 2 nos.
e. Backup lights 2 nos.
f. Cabin Dome & Ladder lights
g. Service light in rear axle & under hood (Wherever applicable)
h. Manual/ Auto backup light

4.20 Guards and shields:

Adequate guards and shields, which comply with ISO 3457, shall be provided on the dumper.

5. Safety Features:

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment.

a. Mechanical steering locking device to prevent untoward movement of steering wheel and tyre while persons are working underneath the cabin when engine is ON.

b. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot shall be provided.

c. **Proximity Warning Device** - Should comply as per requirement of Clause 14 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

d. Mechanical Device to avoid head to Tail Collision of Dumpers: - Should comply as per requirement of **Clause 4** of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020. The manufacturers should submit a self-certificate explicitly stating that any one of the features fitted in the Dumper shall provide additional protection to the operator and it shall not affect the normal operation of the Dumper on the gradients and its steerability, loading or dumping operations.

e. Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

f. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

g. Methodology/ facility to be provided in the dumper to restrict/ control the speed as determined by management.

h. Propeller shaft guard (Wherever applicable).

i. Mirrors, right and left.

j. Hot zones shall be separated from cold zone by providing suitable arrangement.

k. Exhaust pipes and turbocharger shall be adequately guarded.

l. Load Indicator- Should comply as per requirement of Clause 8 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

m. Dump Body raised position indicator with warning- Should comply as per requirement of Clause-6 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

n. Safety provision for holding the dump body in hoist condition.

o. Manual wheel stopper while parking dumper in gradient.

p. Auto dipping system - Should comply as per requirement of Clause -3 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

q. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

r. Retro reflective reflectors on all sides for visibility of truck during night

s. Cabin Guard Extension – Canopy shall cover the operator's cabin fully.

t. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

6. Ancillary Equipment and other requirements:

The following shall be provided on the dumper:

a. Front and rear tow hooks.
b. Pressurized radiator cap with chain attachment.
c. Headlight high beam indicator
d. Cab protection spill guard
e. Water separators in air lines (Where applicable)
f. Rock ejector bar/chains between each set of dual rear wheels
g. Suitable on-board payload monitoring system with a feature to store & retrieve data of at least one month
h. Self-diagnostic and real time monitoring electronic tool
i. Tyre inflation kit.

8. Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

i. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
ii. Maximum speed, average speed, distance travelled, waiting time, loading time, unloading time, load carried by dumper for each trip and cumulative.
iii. Engine oil pressure
iv. Coolant temperature
v. Coolant level
vi. Engine RPM
vii. Fuel level and fuel consumption rate
viii. Hyd. oil temperature
ix. Engine electrical system - Battery voltage and Alternator out put
x. All vital parameters of drive system including transmission Fault codes along with details
xi. Tyre inflation pressure & temperature

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Dumper Operators and control room person for the following events:

a) In the case of operator exceeds pre-defined maximum speed for different dumpers.

b) In the event of dumpers travelling in opposite direction falls in line.
c) To maintain safe distance between dumpers travelling in the same direction.
d) Fire warning to operator in case of catching fire.
e) Dump Body hoist indication to be given in the event of dumper travelling in dump body hoist position.

The supplier shall provide the following:

A. There has to be one integrated single online port for capturing all the vital data.
B. The real time interface telemetry port will be provided in the equipment
C. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
D. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
E. There shall be integrated on board data management system as explained at point no.3 as above.
F. Permission to third party for interfacing, data collection through online port.
G. Signing of Non-disclosure agreement to protect intellectual property right on either side.
H. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
I. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

8. Special Guarantees

The following guarantee will apply for the different components from the accepted date of commissioning.

a. Body, Chassis – 10,000 hours.
b. Complete Engine system- 8000 hours
c. Transmission Assembly (where applicable) - 8000 hours
d. Differential / Final drive (where applicable) - 8000 hours
e. Disc Brake - 8000 hours
f. OTR tyre - 4500 hours or 12 months first life before re-treading

In case any tyre is found to be defective/failure in the period of special guarantee, joint inspection shall be made by representative of Subsidiary company &

equipment supplier. Then equipment supplier shall replace the defective tyre with a new tyre of same type and size.

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

No repair of such components or use of spares supplied against Clause: C.6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

In case of any failure of the above sub-assemblies except tyres beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser.

9. Performance Guarantee:

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 4500 (four thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty- percent) annually for a period of 36 months from the date of accepted date of commissioning, and 80% (Seventy Five percent) annually for following years of the contract period.

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

10. Expected life of major assemblies:

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

Equipment	Major Assemblies	Expected Life* (in Hours)
Dumpers	Body Chassis	
	Engine	
	Transmission	
	Differential	
	Final Drive	

Note - * Expected life means life before first overhaul

11. Information to Be Provided by the Bidder

The bidder shall furnish the following information. All technical information shall be in SI units.

11.1 General

a) Number of similar models supplied during the last five (5) years. The information shall be given in the following format and in the order of most recent first:

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of special tools to be provided with the equipment.

c) Details of erection programme for the bid.

d) Details of nearest Depot/Warehouse and Service Facility available for the present offer

11.2 Technical Details

a) Latest engine performance curves showing net power, net torque and a specific fuel consumption of the installed engine, measures according to ISO 9249.
b) Maximum speed determined according to ISO 6014
c) Latest Rim-pull - Speed - gradeability Curves of the offered model clearly indicating Driving speed fully loaded up 14% effective grade.
d) Latest retarding performance chart of the offered model in accordance with ISO 10268 clearly indicating: Maximum constant speed fully loaded down 10% effective grade.
e) Calculations determining the time for the operating cycle specified in

clause 11.3.12.

f) Result of service and secondary brake stopping tests carried out according to ISO 3450.

Braking system tested	Slope (%)	Machine Speed (km/h)	Stopping distance(m)
Service			
Secondary			

g) Turning diameter in accordance with ISO 7457.

h) Detail technical description of all systems of the dumper.

i) Detail technical description of Electronic Control Module used, its integration with other components of power train, details of data capturing (active, intermittent & calculated) & full feature, Diagnostic Tool's software version, data storage capacity & features and Payload Monitoring System fitted in the Dumper.

j) Layout drawings and detailed technical descriptions of hydraulic systems and components

k) Details of major bought out assemblies and sub-assemblies including manufacturer's name & full address, type, model etc.

l) Comprehensive commercial literature specifications, the content of which must comply with ISO 7132.

m) Operation and Maintenance manuals in accordance with ISO 6750 as indicated in clause A-3 of section VI.

n) Details and layout of Automatic lubricating system.

o) Details and layout of Automatic fire detection and suppression system.

p) Details of rear vision system

q) Details of proximity warning device.

r) Calculations and drawings verifying the body capacity.

11.3 Dimensions, Weights and Performance Details

11.3.1 Dimensions

a. Maximum Overall length (m)
b. Maximum overall width (m)
c. Maximum height without body (m)
d. Maximum height with body (m)
e. Loading height (m)
f. Dump height (m)
g. Discharge height (m)
h. Maximum body depth (m)
i. Body target area [inside length and width at top] (m^2)
j. Wheel base (m)

11.3.2 Weight Distribution

a) Empty vehicle (kg)
Front axle (kg)
Rear axle kg)
Total (kg)

b) Loaded vehicle (kg)
Front axle (kg)
Rear axle (kg)
Total (kg)

c) Payload (kg)

11.3.3 Engine

a. Manufacturer and model
b. Number of cylinders
c. Bore (mm)
d. Stroke (mm)
e. Displacement (litre)
f. ISO net power at.....r / min (kW)
g. Maximum torque at .....r/min (Nm)
h. ECM /alternate - make, model & data storage capacity
i. Diagnostic tool's make, model, software version, data storage capacity & features.

11.3.4 Mechanical Drive System)

I Transmission

a) Manufacturer and model
b) Type
c) Number of gear speeds: forward and reverse
d) Travel speeds: forward and reverse

II Differential

a) Manufacturer and model
b) Type
c) Ratio

III Final Drive

a) Manufacturer and model
b) Type
c) Ratio

11.3.5 Suspension

I Front

a) Type
b) Stroke
c) Load - deflection rate: loaded and empty

II Rear

a) Type

b) Stroke
c) Load - deflection rate: loaded and empty

11.3.6 Steering

a) Type
b) Emergency steer method

11.3.7 Brakes

11.3.7.1 Service Brake:
I. Front
a) Type
b) Actuating System
II. Rear
a) Type
b) Actuating System

11.3.7.2 Emergency Brakes
a) Type
b) Actuating System

11.3.7.3 Parking brakes
a) Type
b) Actuating System

11.3.8 Retarder

a) Type
b) Actuating System

11.3.9 Tyres

a) Manufacturer
b) Size and type
c) Tread
d) Rim size
e) TKPH

11.3.10 Hydraulic System

a) Make & model, Number, flow rates and operating pressures of pumps
b) Make & model, Number, piston diameters and stroke length of cylinders
c) Relief valve operating pressures

11.3.11 Electrical System

a) Starter make and model
b) Alternator make and model
c) Batteries numbers and rating
d) Lighting details (number, type & rating)

11.3.12 Operating Cycle

The operating cycle, for which the bidder shall provide the information required in clause 11.2 (e), shall be:
Time for hauling, rated payload and returning empty to the place of loading on a haul road of the following profile with a rolling resistance of 2%.
First 1500 meters up a 12% grade, next 200 meters level, next 200 meters up a 10% grade, last 100 meters level.
A fixed time of six (6) minutes for loading and dumping shall be added to this time to calculate the total operating cycle.

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 11. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 11. A detrimental deviation of up to 2½% will be accepted

1	Specific Fuel Consumption for engine	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Pay load Capacity	To be tested at Works / Project Site.
3	Engine Net Power & RPM as per ISO 9249	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
4	Driving Speed - fully loaded up 14% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
5	Retard Speed - fully loaded down 10% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
6	Service Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
7	Secondary Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
8	Turning Dimension as per ISO 7457	To be tested at Works / Project Site.
9	Dump body should accommodate 6 pass loads from 5 CuM shovel & 5 pass loads from 6 CuM Shovel without spillage.	To be tested at Project Site.

70 KL Water Sprinkler

PART D:- EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATION OF 70KL WATER SPRINKLER

1. Scope of specification

Tyre mounted mobile water sprinkler capable of carrying water of 70Kl mounted on a suitable off high way rear dumper chassis, equipped with water pump and suitable series of nozzles to sprinkle water at a suitable pressure to a minimum width of 20 metres maintaining constant sprinkling velocity on the haul roads and other operating zones of open cast mine in a manner to suppress dust but to avoid muddy road condition.

2. References

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867	Earth-moving machinery - Access system.
ISO 3450	Earth-moving machinery - Wheeled machines - Performance requirements and test procedures for braking systems.
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications.
ISO 3471	Earth-moving machinery - Roll-Over Protective Structures - Laboratory tests and performance requirements.
ISO 5010	Earth-moving machinery - Rubber Tyres Machines - Steering requirements.
ISO 6014	Earth-moving machinery - Determination of ground speed.
ISO 6405-1	Earth-moving machinery - Symbols for operator controls and other displays - Part 1 Common symbols.
ISO 6405-2	Earth-moving machinery - Symbols for operator controls and other displays - Part 2 Specific symbols for machines, equipment and accessories.
ISO 6682	Earth-moving machinery - Zones of comfort and reach for control.
ISO 6750	Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7132	Earth-moving machinery - Dumpers - Terminology and commercial specifications
ISO 7457	Earth-moving machinery - Measurement of turning dimensions of wheeled machines
ISO 9249	Earth-moving machinery - Engine test code - Net power
ISO 10268	Earth-moving machinery - Retarders for dumpers and tractor scrapers - performance tests
ISO 10968	Earth-moving machinery - Operator's control.

3. **Design Criteria**

The water sprinkler shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours' duration per day throughout the year.
The water sprinkler shall be suitable for pressurized discharge through sprinkling nozzles and higher spreading width for effective dust settling

4. Technical requirements

4.1 Engine

The sprinkler shall be powered by an environment-friendly, 4-stroke diesel engine of not less than 645 kW net power measured between 1700 and 2200 r/min according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier II or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for EPA Tier II or above or equivalent from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet up to 3 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 Drive system

4.2.1 Transmission

The water sprinkler shall be provided with an off-highway automatic power shift hydraulic transmission with lock-up clutch and downshift and reverse inhibitors. Suitable protection of the transmission pan from external damage should be provided. The pan guard should be designed to minimize accumulation of dirt and debris

4.2.2 Propel and final drive

A dynamically balanced propel shaft with universal joints at both ends should be utilized for power transmission. Adequate means should be provided to prevent damage to other components in the event of failure of the universal joints.

The final drive shall comprise of a heavy-duty differential with high quality spiral bevel gear and pinions and a heavy-duty planetary gear system and drive axle.

4.3 Suspension

Suitable (hydra-air) independent front and rear gas over oil suspension shall be provided to absorb road shocks and prolong chassis & tire life.

4.4 Steering

Full hydraulic orbitrol power steering and emergency steering, which complies with ISO 5010, shall be provided. Emergency steering shall be automatically activated in the event of failure of the normal steering power source. Auto emergency steering to be provided.
Provision of Steering Lock is to be made to prevent abnormal movement of steering along with the tyre even though the steering is not being operated when some works are carried out below cabin in the engine running condition.

4.5 Hoses

Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.6 Brakes

Suitable reliable service, secondary and parking brakes, which comply with ISO 3450, shall be provided.

4.6.1 Service Brakes

The front service brakes shall be air and / or hydraulic actuated caliper/ disc type and should operate automatically in the event of low air/oil pressure.

The rear service brakes shall be air and / or hydraulic actuated oil cooled multiple disc type / hydraulic disc type / caliper type and should operate automatically in the event of low air/ oil pressure.

They should preferably be fully enclosed to prevent entry of dust & water and designed for low maintenance.

4.6.2 Parking Brakes

Parking brakes shall be oil cooled spring applied, hydraulically released, apply to rear wheels, inbuilt in rear brake group and should be operational even at zero system pressure.

4.6.3 Emergency Brakes

Provision of Automatic Emergency Brake along with manual Emergency Braking system, which shall be operative in the event of failure of Service Brake, shall be provided

4.7 Retarder

Both Automatic and manual retarding control system to control speed while descending grades shall be provided.

4.8 Tyres

Tubeless, rock duty, cut-resistant E-4 type tyres of suitable size and TKPH rating to match the operational condition.

4.9 Frame

The frame should be rugged durable construction of high strength steel and free from any stress concentration. The design must take care of all forces encountered during the operation of the Water Sprinkler.

4.10 Water Tank

The water tank should be of minimum 70KL capacity. Water tank should be welded and reinforced with suitable steel plate; cross baffles should be provided to avoid heavy surging. Interior of the tank should be coated with special anti-corrosive non-toxic paint.

The tank shall have covered opening on the top for filling using external pumps (or gravity feed). A suitable centrifugal type water pump capable of using unfiltered mine water for spraying shall be provided. Both gravity sprinkling and pressurized water sprinkling having a high impinging force with suitable spraying nozzles covering the entire width of the machine shall be provided. The design of water tank should be such that the stability of the machine is maintained in all operating conditions especially during turning.

Suitable arrangement to enable manual inspection of inside of the water tank by means of ladder, railing, fencing, fender etc. on the side and top of the water tank are to be provided.

Suitable fire-fighting system shall be provided at the top of tank.

Suitable tank lifting mechanism shall be provided to ease of maintenance.

4.11 Fuel Tank

The fuel tank shall be of sufficient capacity to allow 16 hours' operation without refueling and be provided with a level indicator and a lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Lubrication System

A centralized PLC / microprocessor / microcontroller based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

4.13 Fire Detection and Suppression System

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.14 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.14.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.14.2 Operator's Protective Structures:

Dumper shall be equipped with a roll-over protective structure (ROPS). The ROPS shall comply with ISO 3471. Also, FOPS shall be provided as per ISO -ISO3449

4.14.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be padded and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS

(Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.14.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.14.5 Starting and Stopping System:

Water Sprinkler shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement).

4.15 Gauges and Indicators/Electronic Display

The following shall be provided:

a. Water temperature gauge
b. Air cleaner vacuum gauge
c. Engine oil pressure gauge
d. Converter oil temperature gauge/indicator (where applicable)
e. Fuel capacity gauge
f. Engine tachometer
g. Engine hour meter
h. Speedometer
i. Air pressure gauge (if applicable)
j. Voltmeter (where applicable)
k. Water level of tank indicator
l. Hydraulic Oil Temperature Gauge

In case any of these gauge(s)/indicators is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.16 Warning Alarms/Lights/Indicator

Warning systems shall be provided for the following:

a. Reversing –DGMS complied Audio Visual Alarm (Type confirming to Specifications as per DGMS (Approval)/ AVA/01 dated 25-05-2010 of

DGMS)

b. Parking Brake actuation
c. High torque converter oil temperature (where applicable)
d. Low engine oil pressure
e. High coolant temperature
f. Low air pressure (where applicable)
g. Emergency steering
i. Indicator light for retarding, over speed & service brakes
j. Warning alarms in case of failure of automatic lubrication system.
k. Tyre pressure monitoring system in cabin to be incorporated.

4.17 Electrical Equipment

The water sprinkler shall be provided with the following

a. 24V DC electrical system with suitably rated alternator of reputed make
b. Electrical starter motor of reputable make
c. High capacity maintenance free batteries of reputed make
d. Battery isolation switch/ Relay

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance.

4.18 Lighting

Adequate lighting of LED Type shall be provided for safe night shift operation. Then lighting system should include the following; -

a) 4 nos. Headlight,
b) Stop and tail lights
c) Hazard and Turn signal lights (left and right) on both front and rear LED type
d) Fog lamps 2 nos.
e) Backup lights 2 nos.

4.19 Guards and shields

Adequate guards and shields, which comply with ISO 3457, shall be provided on the dumper.

4.20 Fire Extinguisher

A fire extinguisher shall be provided on the dumper, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08thJuly2013**.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.21 Water System

The water system should be provided with suitable pump driven by a hydraulic motor or any other suitable basis. The suction & discharge pipe should be of adequate diameter with suitable valves. The sprinkling should be pressurized and constant sprinkling velocity is to be maintained and should be capable of sprinkle at least 20 meter width. In addition to pressurized sprinkling, provision of gravity sprinkling should also be provided through perforated manifold connected to tank bottom. Self-filling provision from outside reservoir or pond by connecting the pump suction through armored hose with foot valve should be provided. The system should be equipped with quick connecting adopter(s) & suitable nozzles for firefighting unit adoption.

In addition to general water sprinkling system the sprinkler should also have a water mist system. The system should be operated by a suitable pump so that high pressure mist comes out of the mist nozzles. Sufficient no. of nozzles should be provided for higher coverage area.

The system should be preferably operable from operator's cabin.

The system should incorporate a suitable filter so that the water gets filtered before entering the mist piping/ nozzles.

5. Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment.

a. Mechanical steering locking device to prevent untoward movement of steering wheel and tyre while persons are working underneath the cabin when engine is ON.
b. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot shall be provided.
c. **Proximity Warning Device** - Should comply as per requirement of Clause 14 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
d. Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in whichcable/wire are laid shall be of fire resistant /fire retarder type.
e. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
f. Propeller shaft guard (Wherever applicable).
g. Mirrors, right and left.
h. Hot zones shall be separated from cold zone by providing suitable arrangement.

i. Exhaust pipes and turbocharger shall be adequately guarded.
j. Safety provision for holding the dump body in hoist condition.
k. Manual wheel stopper while parking water sprinkler in gradient.
l. Auto dipping system - Should comply as per requirement of Clause -3 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
m. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
n. Retro reflective reflectors on all sides for visibility of water sprinkler during night
o. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

6. Ancillary Equipment and other requirements

The following shall be provided on the dumper:

a. Front and rear tow hooks or lifting loops.
b. Pressurized radiator cap with chain attachment
c. Head light high-beam indicator.
d. Water separators in air lines.
e. Rock ejector bar/chains between each set of dual rear wheels
f. Front pressurized sprinkling
g. Tyre Inflation Kit
h. One hose reel is to be provided with minimum 25 mtr length along with all fittings so that it can be easily coupled & used in case of fire fighting
i. Self-diagnostic and real time monitoring electronic tool

7. Special Guarantees

The following guarantee will apply for the different components from the accepted date of commissioning.

a) Body, Chassis – 36 months or 10,000 hours. (Whichever is earlier)
b) Complete Engine system-24 months or 6000 hours. (Whichever is earlier)
c) Transmission Assembly (where applicable) – 24 months or 6000 hours. (Whichever is earlier)
d) Differential / Final drive (where applicable) – 24 months or 6000 hours. (Whichever is earlier)
e) Disc Brake - 24 months or 6000 hours. (Whichever is earlier)
f) OTR tyre - 3500 hours or 12 months first life before re-treading

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual .

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of the subsidiary shall be final and binding for both supplier and purchaser

8. Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 3000 (three thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (Eighty percent) annually for following years of the contract period.

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

9. Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

a) Working hour,
b) Maximum speed, average speed, distance travelled
c) Engine oil pressure & temperature
d) Coolant temperature
e) Coolant level
f) Engine RPM
g) Fuel level
h) Hyd. oil temperature
i) Engine electrical system - Battery voltage and Alternator out put
j) All vital parameters of drive system including transmission Fault codes along with details
k) Tyre inflation pressure & temperature

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

The supplier shall provide the following:

i. There has to be one integrated single online port for capturing all the vital data.
ii. The real time interface telemetry port will be provided in the equipment
iii. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
iv. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
v. There shall be integrated on board data management system as explained at point no.3 as above.
vi. Permission to third party for interfacing, data collection through online port.
vii. Signing of Non-disclosure agreement to protect intellectual property right on either side.
viii. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
ix. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator

10. Expected life of major assemblies

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
Water Sprinkler	Body Chassis	
	Differential (where applicable)	
	Complete Engine system	
	Transmission Assembly	

Note - * Expected life means life before first overhaul.

11. Information to Be Provided by The Bidder

The bidder shall furnish the following information. All technical information shall be in SI units.

11.1 General

a) Number of similar model supplied during the last five (5) years. The information shall be given in the following format and in the order of most recent first:

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of special tools to be provided with the equipment.

c) Details of erection programme for the bid.

d) Details of nearest Depot/Warehouse and Service Facility available for the present offer.

11.2 Technical Details

a. Latest engine performance curves showing net power, net torque and a specific fuel consumption of the installed engine, measures according to ISO 9249.

b. Maximum speed determined according to ISO 6014

c. Latest Rim-pull - Speed - gradeability Curves of the offered model clearly indicating Driving speed fully loaded up 14% effective grade.

d. Latest retarding performance chart of the offered model in accordance with ISO 10268 clearly indicating: Maximum constant speed fully loaded down 10% effective grade.

e. Calculations and drawings verifying the water tank capacity

f. Result of service and secondary brake stopping tests carried out according to ISO 3450.

Braking system tested	Slope (%)	Machine Speed (km/h)	Stopping distance(m)
Service			
Secondary			

g. Turning diameter in accordance with ISO 7457.
h. Detail technical description of all systems of the Water Tanker including water system with all details as per clause 4.21
i. Layout drawings and detailed technical descriptions of hydraulic systems and components
j. Details of major bought out assemblies and sub-assemblies including manufacturer's name & full address, type, model etc.
l. Comprehensive commercial literature specifications, the content of which must comply with ISO 7132.
m. Operation and Maintenance manuals in accordance with ISO 6750 as indicated in clause A-3 of section VI.
n. Details and layout of Automatic lubricating system.
o. Details and layout of Automatic fire detection and suppression system.
p. Details of rear vision system
q. Details of proximity warning device.

11..3 ***Dimensions, Weights and Performance Details***

11..3.1 ***Dimensions***

a) Maximum overall length
b) Maximum overall width
c) Maximum height, without tank
d) Maximum height, with tank
e) Wheelbase

11.3.2 **Weight Distribution**

a) Empty vehicle Front axle Rear axle Total
b) Loaded vehicle (with water)
Front axle
Rear axle Total

11.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at ..... r/min
g) Maximum torque

11.3.4 **Transmission**

a) Make and Model
b) Type
c) Number of gear speeds, forward and reverse
d) Travel speeds, forward and reverse (kmph)

11.3.5 **Differential**

a) Type & Make
b) Ratio

11.3.6 **Final Drive**

a) Type & Make
b) Ratio

11.3.7 **Suspension**

11.3.7.1 **Front**

a) Type & Make
b) Stroke
c) Load - deflection rate, loaded and empty

11.3.7.2 **Rear**

a) Type & Make
b) Stroke
c) Load - deflection rate, loaded and empty

11.3.8 **Steering**

a) Type & Make
b) Emergency steer method

11.3.9 **Brakes**

11.3.9.1 **Service brakes: Make & Model**

11.3.9.1.1 **Front**

a) Type
b) Actuating system

11.3.9.1.2 **Rear**

a) Type
b) Actuating system

11.3.9.2 **Secondary brakes**

a) Type
b) Actuating system

11.3.9.3 **Parking brake**

a) Type
b) Actuating system

11.3.9.4 **Retarder**

a) Type
b) Actuating system

11.3.10 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

11.3.11 **Hydraulic System**

a) Make & model, number, flow rates, operating pressures of pumps
b) Make & model, number, piston diameters, stroke lengths of cylinders
c) Relief valve operating pressures
d) Make &model, number, flow rates of motors

11.3.12 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting details

11.3.13 **Water System**

11.3.13.1 **Water Pump**

a) Type of pump
b) Capacity of pump in CuM/Hour @---------- r/min & Head ------meter
c) Drive to pump

11.3.13.2 **Piping**

a) Suction Dia
b) Discharge Dia
c) Type of valve

11.3.13.3 **Sprinkling**

a) Details of pressurized sprinkling system
b) Spreading Width
c) Details of Gravity Sprinkling Arrangement
d) Type of Nozzles
e) Details of Self filling system
f) Details of firefighting unit adoption

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 11. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 11. A detrimental deviation of up to 2½% will be accepted

1	Specific Fuel Consumption for engine	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Pay load Capacity	To be tested at Works / Project Site.
3	Engine Net Power & RPM as per ISO 9249	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
4	Driving Speed - fully loaded up 14% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
5	Retard Speed - fully loaded down 10% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
6	Service Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
7	Secondary Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
8	Turning Dimension as per ISO 7457	To be tested at Works / Project Site.
9	Water tank should accommodate rated capacity of water,	To be tested at Project Site.

28KL Water Sprinkler

PART D:- EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATION OF 28KL WATER SPRINKLER

1. Scope of specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, self-propelled, wheeled Water Sprinkler of not less than 28KL capacity mounted on 35T off the highway rear dumper chassis for use in opencast mine in CIL.

2. References

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867	Earth-moving machinery - Access system.
ISO 3450	Earth-moving machinery - Wheeled machines - Performance requirements and test procedures for braking systems.
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications.
ISO 3471	Earth-moving machinery - Roll-Over Protective Structures - Laboratory tests and performance requirements.
ISO 5010	Earth-moving machinery - Rubber Tyres Machines - Steering requirements.
ISO 6014	Earth-moving machinery - Determination of ground speed.
ISO 6405-1	Earth-moving machinery - Symbols for operator controls and other displays - Part 1 Common symbols.
ISO 6405-2	Earth-moving machinery - Symbols for operator controls and other displays - Part 2 Specific symbols for machines, equipment and accessories.
ISO 6682	Earth-moving machinery - Zones of comfort and reach for control.
ISO 6750	Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7132	Earth-moving machinery - Dumpers - Terminology and commercial specifications
ISO 7457	Earth-moving machinery - Measurement of turning dimensions of wheeled machines
ISO 9249	Earth-moving machinery - Engine test code - Net power
ISO 10268	Earth-moving machinery - Retarders for dumpers and tractor scrapers - performance tests

ISO 10968	Earth-moving machinery - Operator's control.

3. Design Criteria

The water sprinkler shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours' duration per day throughout the year.
The water sprinkler shall be suitable for pressurized discharge through sprinkling nozzles and higher spreading width for effective dust settling

4. Technical requirements

4.1 Engine

The water sprinkler shall be powered by a direct injection 4 -stroke diesel engine of not less than 262KW net power measured between 1700 and 2200 r/min at least at one RPM according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine shall be environment friendly with minimum EPA Tier I or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of tender. Certificate for EPA Tier I or above or equivalent from engine manufacturer is to be enclosed

4.2 Drive system

4.2.1 Transmission

The water sprinkler shall be provided with an off-highway automatic power shift hydraulic transmission with lock-up clutch and downshift and reverse inhibitors. Suitable protection of the transmission pan from external damage should be provided. The pan guard should be designed to minimize accumulation of dirt and debris

4.2.2 Propel and final drive

A dynamically balanced propel shaft with universal joints at both ends should be utilized for power transmission. Adequate means should be provided to prevent damage to other components in the event of failure of the universal joints.

The final drive shall comprise of a heavy-duty differential with high quality spiral bevel gear and pinions and a heavy-duty planetary gear system and drive axle.

4.3 Suspension

Suitable (hydra-air) independent front and rear gas over oil suspension shall be provided to absorb road shocks and prolong chassis & tire life.

4.4 Steering

Full hydraulic orbitrol power steering and emergency steering, which complies with ISO 5010, shall be provided. Emergency steering shall be automatically activated in the event of failure of the normal steering power source. Auto emergency steering to be provided.

Provision of Steering Lock is to be made to prevent abnormal movement of steering along with the tyre even though the steering is not being operated when some works are carried out below cabin in the engine running condition.

4.5 Hoses

Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.6 Brakes

Suitable reliable service, secondary and parking brakes, which comply with ISO 3450, shall be provided.

4.6.1 Service Brakes

The front service brakes shall be air and / or hydraulic actuated caliper/ disc type and should operate automatically in the event of low oil pressure.

The rear service brakes shall be air and / or hydraulic actuated oil cooled multiple disc type / hydraulic disc type / caliper type and should operate automatically in the event of low air / oil pressure.

They should preferably be fully enclosed to prevent entry of dust & water and designed for low maintenance.

4.6.2 Parking Brakes

The parking brakes should be of caliper type/disc type and operational even at zero system pressure.

4.6.3 Emergency Brakes

Provision of Automatic Emergency Brake along with manual Emergency Braking system, which shall be operative in the event of failure of Service Brake, shall be provided

4.7 Retarder

Both Automatic and manual retarding control system to control speed while descending grades shall be provided.

4.8 Tyres

Tubeless, rock duty, cut-resistant E-4 type tyres size 18.00 - 25 of suitable TKPH rating to match the operational condition.

4.9 Frame

The frame should be rugged durable construction of high strength steel and free from any stress concentration. The design must take care of all forces encountered during the operation of the dumper.

4.10 Water Tank

The water tank should be of minimum 28KL capacity. Water tank should be welded and reinforced with suitable steel plate; cross baffles should be provided to avoid heavy surging. Interior of the tank should be coated with special anti-corrosive non-toxic paint.
The tank shall have covered opening on the top for filling using external pumps (or gravity feed). A suitable centrifugal type water pump capable of using unfiltered mine water for spraying shall be provided. Both gravity sprinkling and pressurized water sprinkling having a high impinging force with suitable spraying nozzles covering the entire width of the machine shall be provided. The design of water tank should be such that the stability of the machine is maintained in all operating conditions especially during turning.
Suitable arrangement to enable manual inspection of inside of the water tank by means of ladder, railing, fencing, fender etc. on the side and top of the water tank are to be provided.
Suitable fire-fighting system shall be provided at the top of tank.

Suitable tank lifting mechanism shall be provided to ease of maintenance.

4.11 Fuel Tank

The fuel tank shall be of sufficient capacity to allow 16 hours' operation without refueling and be provided with a level indicator and a lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Lubrication System

A centralized PLC / microprocessor / microcontroller based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

4.13 Fire Detection and Suppression System

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing

agent for effective fire-fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.

- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.14 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.14.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel

is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.14.2 Operator's Protective Structures:

Dumper shall be equipped with a roll-over protective structure (ROPS). The ROPS shall comply with ISO 3471. Also, FOPS shall be provided as per ISO -ISO3449

4.14.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be padded and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.14.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.14.5 Starting and Stopping System:

Water Sprinkler shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement).

4.15 Gauges and Indicators/Electronic Display

The following shall be provided:

a. Water temperature gauge
b. Air cleaner vacuum gauge
c. Engine oil pressure gauge
d. Converter oil temperature gauge/indicator (where applicable)
e. Fuel capacity gauge
f. Engine tachometer
g. Engine hour meter
h. Speedometer
i. Air pressure gauge (if applicable)
j. Voltmeter (where applicable)
k. Water level of tank indicator
l. Hydraulic Oil Temperature Gauge

In case any of these gauge(s)/indicators is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product

4.16 Warning Alarms/Lights/Indicator

Warning systems shall be provided for the following:

a. Reversing –DGMS complied Audio Visual Alarm (Type confirming to Specifications as per DGMS (Approval)/ AVA/01 dated 25-05-2010 of DGMS)
b. Parking Brake actuation
c. High torque converter oil temperature (where applicable)
d. Low engine oil pressure
e. High coolant temperature
f. Low air pressure (where applicable)
g. Emergency steering
h. Indicator light for retarding, over speed & service brakes
i. Warning alarms in case of failure of automatic lubrication system.
j. Tyre pressure monitoring system in cabin to be incorporated.

4.17 Electrical Equipment

The Water Sprinkler shall be provided with the following

a. 24V DC electrical system with suitably rated alternator of reputed make
b. Electrical starter motor of reputable make
c. High capacity maintenance free batteries of reputed make

d. Battery isolation switch/ Relay

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance.

4.18 Lighting

Adequate lighting of LED Type shall be provided for safe night shift operation.

Then lighting system should include the following; -

a. 4 nos. Headlight,
b. Stop and tail lights
c. Hazard and Turn signal lights (left and right) on both front and rear LED type
d. Fog lamps 2 nos.
e. Backup lights 2 nos.

4.19 Guards and shields

Adequate guards and shields, which comply with ISO 3457, shall be provided on the dumper.

4.20 Fire Extinguisher

A fire extinguisher shall be provided on the dumper, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) CircularNo.02 dtd. 08thJuly2013**.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.21 Water System

The water system should be provided with suitable pump driven by a hydraulic motor or any other suitable basis. The suction & discharge pipe should be of adequate diameter with suitable valves. The sprinkling should be pressurized and constant sprinkling velocity is to be maintained. In addition to pressurized sprinkling, provision of gravity sprinkling should also be provided through perforated manifold connected to tank bottom. Self-filling provision from outside reservoir or pond by connecting the pump suction through armored hose with foot valve should be provided. The system should be equipped with quick connecting adopter(s) & suitable nozzles for firefighting unit adoption.

In addition to general water sprinkling system the sprinkler should also have a water mist system. The system should be operated by a suitable pump so that high pressure mist comes out of the mist nozzles. Sufficient no. of nozzles should be provided for higher coverage area.
The system should be preferably operable from operator's cabin
The system should incorporate a suitable filter so that the water gets filtered before entering the mist piping/ nozzles.

5. Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment.

a. Mechanical steering locking device to prevent untoward movement of steering wheel and tyre while persons are working underneath the cabin when engine is ON.
b. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot shall be provided.
c. **Proximity Warning Device** - Should comply as per requirement of Clause 14 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
d. Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in whichcable/wire are laid shall be of fire resistant /fire retarder type.
e. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
f. Propeller shaft guard (Wherever applicable).
g. Mirrors, right and left.
h. Hot zones shall be separated from cold zone by providing suitable arrangement.
i. Exhaust pipes and turbocharger shall be adequately guarded.
j. Safety provision for holding the dump body in hoist condition.
k. Manual wheel stopper while parking water sprinkler in gradient.
l. Auto dipping system - Should comply as per requirement of Clause -3 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
m. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
n. Retro reflective reflectors on all sides for visibility of water sprinkler during night
o. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

6. Ancillary Equipment and other requirements

The following shall be provided on the dumper:

a) Front and rear tow hooks or lifting loops.
b) Pressurized radiator cap with chain attachment
c) Head light high-beam indicator.
d) Water separators in air lines.
e) Rock ejector bar/chains between each set of dual rear wheels
f) Front pressurized sprinkling
g) Tyre Inflation Kit
h) One hose reel is to be provided with minimum 25 mtr length along with all fittings so that it can be easily coupled & used in case of fire fight

7. Special Guarantees

The following guarantee will apply for the different components from the accepted date of commissioning.

a. Body, Chassis – 36 months or 10,000 hours. (Whichever is earlier)
b. Complete Engine system-24 months or 6000 hours. (Whichever is earlier)
c. Transmission Assembly (where applicable) – 24 months or 6000 hours. (Whichever is earlier)
d. Differential / Final drive (where applicable) – 24 months or 6000 hours. (Whichever is earlier)
e. Disc Brake - 24 months or 6000 hours. (Whichever is earlier)
f. OTR Tyre – 3500 hrs. or 12 months

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual

8. Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 3000 (three thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (Seventy Five percent) annually for following years of the contract period.

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of the subsidiary shall be final and binding for both supplier and purchaser

12. Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

a) Working hour
b) Maximum speed, average speed, distance travelled,
c) Engine oil pressure & temperature
d) Coolant temperature
e) Coolant level
f) Engine RPM
g) Fuel level
h) Hyd. oil temperature
i) Engine electrical system - Battery voltage and Alternator out put
j) All vital parameters of drive system including transmission Fault codes along with details
k) Tyre inflation pressure & temperature

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
2. The real time interface telemetry port will be provided in the equipment
3. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
4. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.

5. There shall be integrated on board data management system as explained at point no.3 as above.
6. Permission to third party for interfacing, data collection through online port.
7. Signing of Non-disclosure agreement to protect intellectual property right on either side.
8. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
9. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator

10. **Expected life of major assemblies**
    Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
Water Sprinkler	Body Chassis	
	Differential (where applicable)	
	Complete Engine system	
	Transmission Assembly	

Note - * Expected life means life before first overhaul.

11. Information to Be Provided by the Bidder

The bidder shall furnish the following information. All technical information shall be in SI units.

11.1 General

a) Number of similar model supplied during the last five (5) years. The information shall be given in the following format and in the order of most recent first:

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of special tools to be provided with the equipment.
c) Details of erection programme for the bid.
d) Details of nearest Depot/Warehouse and Service Facility available for the present offer.

11.2 Technical Details

a) Latest engine performance curves showing net power, net torque and a specific fuel consumption of the installed engine, measures according to ISO 9249.

b) Maximum speed determined according to ISO 6014

c) Latest Rim-pull - Speed - gradeability Curves of the offered model clearly indicating Driving speed fully loaded up 14% effective grade.

d) Latest retarding performance chart of the offered model in accordance with ISO 10268 clearly indicating: Maximum constant speed fully loaded down 10% effective grade.

e) Calculations and drawings verifying the water tank capacity

f) Result of service and secondary brake stopping tests carried out according to ISO 3450.

Braking system tested	Slope (%)	Machine Speed (km/h)	Stopping distance(m)
Service			
Secondary			

g) Turning diameter in accordance with ISO 7457.
h) Detail technical description of all systems of the Water Tanker including water system with all details as per clause 4.21
i) Layout drawings and detailed technical descriptions of hydraulic systems and components

j) Details of major bought out assemblies and sub-assemblies including manufacturer's name & full address, type, model etc.
k) Comprehensive commercial literature specifications, the content of which must comply with ISO 7132.

l) Operation and Maintenance manuals in accordance with ISO 6750 as indicated in clause A-3 of section VI.
m) Details and layout of Automatic lubricating system.
n) Details and layout of Automatic fire detection and suppression system.
o) Details of rear vision system
p) Details of proximity warning device.

11..3 ***Dimensions, Weights and Performance Details***

11..3.1 ***Dimensions***

a) Maximum overall length
b) Maximum overall width
c) Maximum height, without tank
d) Maximum height, with tank
e) Wheelbase

11.3.2 **Weight Distribution**

a) Empty vehicle
   Front axle
   Rear axle
   Total
b) Loaded vehicle (with water)
   Front axle
   Rear axle Total

11.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at ..... r/min
g) Maximum torque

11.3.4 **Transmission**

a) Make and Model
b) Type
c) Number of gear speeds, forward and reverse
d) Travel speeds, forward and reverse (kmph)

11.3.5 **Differential**

a) Type & Make
b) Ratio

11.3.6 **Final Drive**

a) Type & Make
b) Ratio

11.3.7 **Suspension**

11.3.7.1 **Front**

a) Type & Make
b) Stroke
c) Load - deflection rate, loaded and empty

11.3.7.2 **Rear**
a) Type & Make
b) Stroke
c) Load - deflection rate, loaded and empty

11.3.8 **Steering**
a) Type & Make
b) Emergency steer method

11.3.9 **Brakes**
11.3.9.1 **Service brakes: Make & Model**

11.3.9.1.1 **Front**
a) Type
b) Actuating system

11.3.9.1.2 **Rear**
a) Type
b) Actuating system

11.3.9.2 **Secondary brakes**
a) Type
b) Actuating system

11.3.9.3 **Parking brake**
a) Type
b) Actuating system

11.3.9.4 **Retarder**
a) Type
b) Actuating system

11.3.10 **Tyres**
a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

11.3.11 **Hydraulic System**
a) Make & model, number, flow rates, operating pressures of pumps
b) Make & model, number, piston diameters, stroke lengths of cylinders
c) Relief valve operating pressures
d) Make &model, number, flow rates of motors

11.3.12 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting details

11.3.13 **Water System**

11.3.13.1 **Water Pump**

a) Type of pump
b) Capacity of pump in CuM/Hour @---------- r/min & Head ------meter
c) Drive to pump

11.3.13.2 **Piping**

a) Suction Dia
b) Discharge Dia
c) Type of valve

11.3.13.3 **Sprinkling**

a) Details of pressurized sprinkling system
b) Spreading Width
c) Details of Gravity Sprinkling Arrangement
d) Type of Nozzles
e) Details of Self filling system
f) Details of firefighting unit adoption

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 11. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 11. A detrimental deviation of up to 2½% will be accepted

1	Specific Fuel Consumption for engine	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Pay load Capacity	To be tested at Works / Project Site.
3	Engine Net Power & RPM as per ISO 9249	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
4	Driving Speed - fully loaded up 14% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
5	Retard Speed - fully loaded down 10% effective gradient (assuming 2% Rolling resistance)	To be tested at Works / Project Site.
6	Service Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
7	Secondary Brake Stopping Distance as per ISO 3450	To be tested at Works / Project Site.
8	Turning Dimension as per ISO 7457	To be tested at Works / Project Site.
9	Water tank should accommodate rated capacity of water,	To be tested at Project Site.

Hydraulic Excavator

5.5 Cum – 6.5 Cum
DIESEL HYDRAULIC FACE SHOVEL

PART D: - EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATION OF DIESEL-POWERED HYDRAULIC EXCAVATOR WITH BUCKET CAPACITY OF 5.5*CuM* – *6.5CuM* FACE SHOVEL.

1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-propelled, crawler mounted diesel powered hydraulic excavator with bucket capacity **of 5.5CuM – 6.5CuM FACE SHOVEL**

2. References

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867 Earth-moving machinery - Access systems

ISO 3457 Earth-moving machinery - Guards and shields - Definitions and specifications ISO 4557 Earth-moving machinery - Excavators - Operator's controls

ISO 6014 Earth-moving machinery - Determination of ground speed

ISO 6015 Earth-moving machinery - Hydraulic excavators - Methods of measuring tool forces

ISO 6405-1 Earth-moving machinery - Symbols for operator controls and other displays - Part 1: Common symbols

ISO 6405-2 Earth-moving machinery - Symbols for operator controls and other displays - Part 2: Specific symbols for machines, equipment and accessories

ISO 6750 Earth-moving machinery - Operation and maintenance - Format and content of manuals

ISO 7135 Earth-moving machinery - Hydraulic excavators - Terminology and commercial specifications

ISO7546 Earth-moving Machinery-Volumetric ratings for hydraulic excavator buckets and Bottom discharge buckets.

ISO 8643 Earth-moving machinery - Hydraulic excavator and back-hoe loader boom lowering control device - Requirements and tests

ISO 9249 Earth-moving machinery –Engine test code-Net power.

ISO 10265 Earth-moving machinery – Crawler machines – Performance requirements and test procedures for braking systems

ISO 10968 Earth-moving machinery – Operator' controls

ISO 3449 Earth-moving machinery -- Falling-object protective structures -- Laboratory tests and performance requirements

ISO 5006 Earth-moving machinery -- Operator's field of view -- Test method and performance criteria

Any other IS/ ISO specifications as may be applicable

3. Design Criteria

The excavator shall be capable of continuous digging for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive, blasted sandstone/rock having **average** density after blasting of 1,800 kg/m^3.

The excavator shall be suitable for 2:1 heaped loading of Rear Dumpers of 60 T capacities.

3.1 Working Range

The excavator with Face Shovel attachment shall have the following working ranges:

a)) Maximum cutting height not less than 12.00 m
b) Maximum digging reach not less than 10.50 m
c) Maximum digging depth not less than 2.00 m
d) Maximum dumping height not less than 8.50 m

3.2 Operating Weight

The operating weight should not be less than 95000 kg.

The bucket digging force measured in accordance with ISO 6015 should be not less than 18000 kg/m of bucket width.

The ratio of arm or bucket digging force to operating weight should be equal to or less than
0.6. The equipment shall be meeting the stability requirement in all operating ranges.

4. Mechanical Specification:

4.1 Bucket:
The excavator shall be supplied with standard rock bucket, completely wear-plated to excavate sand stone abrasive rock having rock density (loose/blasted) of1800 kg/m3. The face bucket shall have capacity **of 5.5CuM – 6.5CuM** according to ISO 7546.

The specific weight of the steel used in construction of bucket shall be not less than 7800 kg/m3.
The tooth points supplied with the bucket shall be preferably hard faced and should have proper, durable, easily removable and shock absorbing type attachment with the bucket.

4.2 Front End Equipment:

The boom and arm should be a rugged durable construction of high strength steel and free from any stress concentrations. The design must take care of all forces i.e., bending, torsion, compression, etc. encountered during operation of the equipment.

Sealed bearings / bushings should be provided at pivot points.

The bucket attachment connecting pins shall be sealed and lubricated.

4.3. Engine:

The excavator shall be powered by direct injection 4-stroke turbo charged diesel engine delivering not less than 445 KW net power measured between 1700 rpm and 2200 rpm according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier II or equivalent or above standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of bid .Certificate for minimum EPA Tier II or equivalent or above from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.4 Hydraulic Drive System:

The excavator hydraulic system should be of proven design for efficient operations. The hydraulic pumps, motors, and cylinders should be field proven large heavy-duty type and have suitable in-built protection from surge, cavitation, loss of oil due to hose leakage or burst, etc. As far as practicable reputable single make pumps, motors, cylinders and valves, etc. shall be used in the machine.

Adequate filtration of hydraulic oil shall be provided. The hydraulic tank preferably be pressurized. An adequate and effective hydraulic oil cooling system shall also be provided.

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing.

A boom lowering control system which complies with ISO 8643 shall be provided.

4.5 Swing System:

An independent hydraulic system should be provided for the swing motion.

Heavy duty Swing Circle with internal swing gear and pinion immersed in lubricant bath & dirt seals shall be provided. Swing Motor Brake should be provided

An upper structure swing lock/suitable arrangement to lock the upper structure shall be provided.

4.6 Propel and Steering:

Independent crawler drive with independent fail-safe braking system and hydraulically operated emergency and parking brakes which comply with ISO 10265 shall be provided.

4.7 Undercarriage:

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. It shall be of welded construction and stress relieved as required.

The sprocket should be a single piece / segmented type. Lifetime lubricated, idler and rollers, and a reliable track tensioning arrangement should be provided.
Crawler shoes shall be heavy duty and designed for ease of replacement whenever necessary.

4.8 Machinery House:

The excavator shall be provided with a machinery house/ suitable arrangement made of steel sheeting supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.

Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator's cab and service platforms and shall comply with ISO 2867.

4.9 Fuel Tank*:*

The fuel tank shall be of sufficient capacity to allow 16 hours operation without refueling and be provided with a level indicator and a lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.10 Lubrication System:

A centralized PLC based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

4.11 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.11.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all

monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.11.2 Operator's Protective Structures:

Shovel shall be equipped with FOPS as per ISO –ISO3449. The ROPS shall also be provided if applicable as per ISO 3471/ ISO 12117-2

4.11.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.11.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.11.5 Starting and Stopping System:
Shovel shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.12 Gauges and Indicators/Electronic Display:

The following shall be provided:

a) Water temperature gauge
b) Engine oil pressure gauge/indicator
c) Fuel capacity gauge
d) Engine tachometer
e) Engine hour-meter
f) Low engine lube oil pressure indicator
g) Hydraulic oil level indicator
h) Air filter clogging indicator
i) Hydraulic Oil Temperature Gauge

In case any of these gauge(s) /indicator are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.13 Warning Alarms:

Warning alarm shall be provided for the following:

a. Radiator coolant level
b. Hydraulic oil level
c. Air cleaner element
d. Engine oil pressure
e. Engine water temperature
f. Hydraulic oil temperature
g. Fuel level
h. Microcomputer (if applicable)
i. Automatic lubrication
j. P.T.O lubrication

4.14 Electrical Equipment:

The excavator shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make
b) Reputed make Electric start motor
c) Reputable make high capacity maintenance free batteries
d) Battery isolation switch / relay.

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance

4.15 Lighting:

Adequate flood lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. All lighting system shall be of LED type.

4.16 Guards and Shields:

Adequate guards and shields which comply with ISO 3457 shall be provided throughout the excavator.

4.17 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant

Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

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4.18 Fire Extinguishers:

An adequate number of fire extinguishers shall be provided at strategic points on the shovel, suitably mounted in heavy-duty brackets for ease of removal.

The extinguishers shall be both dry chemical powder (DCP type) and CO_2 type with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Fire Extinguishers, including Materials and Chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013**.**

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.19 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment.

a) All function cut off switch.
b) Hydraulic oil and air filter clogging indicators.
c) Swing Motor Brake.
d) Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
e) Turbocharger guard.
f) Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
g) Vent valve, if applicable on top of hydraulic tank should be able to be removed without any tool.

h) A baffle plate between cold zone and hot zone
i) Provision for limiting of hydraulic cylinder
j) Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
k) Warning System for Operator Fatigue - Should comply as per requirement of Clause- 2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

5. Ancillary Equipment and Other Requirements:

The following are to be provided with the excavator:

a) Pressurized radiator cap with chain attachment.
b) Hydraulic jack 50T - 1 no.
c) Hydraulic pressure gauges with adopters, sockets suitable for checking Hyd. Pressure in the equipment
d) Torque Wrench/Torque Multiplier -1 no along with sockets applicable for the machine, especially for swing circle & counter weight.
e) Self diagnostic and real time monitoring electronic tool
f) Multi meter for measuring electrical & electronic circuit values provided in the equipment

6.0 Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

i. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
ii. Engine oil pressure
iii. Coolant temperature
iv. Coolant flow
v. Coolant level
vi. Engine RPM
vii. Fuel level and fuel consumption rate
viii. Hyd. oil temperature and pressure
ix. Hyd. Oil Level in the tank
x. Engine electrical system - Battery voltage and Alternator out put
xi. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Shovel Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

A. There has to be one integrated single online port for capturing all the vital data.
B. The real time interface telemetry port will be provided in the equipment
C. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
D. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
E. There shall be integrated on board data management system as explained at point no.3 as above.
F. Permission to third party for interfacing, data collection through online port.
G. Signing of Non-disclosure agreement to protect intellectual property right on either side.
H. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
I. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

7. **Special Guarantees**

The following guarantee will apply for the different components from the accepted date of commissioning

a. Body, Chassis - 10,000 hours
b. Complete engine system - 8000 hours
c. Undercarriage - 5000 hrs.
d. Hydraulic Pumps & motors - 6000 hrs
e. Hydraulic Cylinder Assembly - 6000 hrs
f. Electrical Items, 24V DC - 2000 hrs.
g. Final Drive (Excluding Sprocket) & Steering System- 8000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser.

8. Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 5000 (five thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for following years of the contract period.

[[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

9. Expected life of major assemblies

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	**MAJOR ASSEMBLIES (whichever is applicable)**	**EXPECTED LIFE* (in Hours)**
Hydraulic Shovels	Prime Mover (Diesel)	
	Under carriage	
	Hydraulic pump	
	Hydraulic motor	
	Hydraulic Cylinders	
	Hydraulic control valve	
	Boom & Sticks	
	Bucket (Dipper)	
	Other Electrical items	

Note - * Expected life means life before first overhaul

10. Information to Be Provided by the Supplier:

The Supplier shall furnish the following information. All technical information shall

be in SI units.

10.1 General:

a) Number of similar models supplied during the last five years.
The information shall be given in the following format and in the order of most recent past.

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of tools to be provided with the equipment.
c) Details of erection programme for the bid.

10.2 Technical Details:

a) Volumetric rating of the bucket according to ISO 7546 together with verification calculations and drawings (refer clause 4.1).
b) Maximum bucket and arm cylinder digging forces measured according to ISO 6015.
c) Schematic Drawing of the machine showing the position of the Center of Gravity and it's distance from the Central Axis of Rotation under the following operating conditions:

i. Bucket at maximum digging force position with crawler tracks perpendicular to the face of the cut.

ii. Bucket at maximum digging force position with crawler tracks parallel to the face of the cut.

d) Engine performance curves of net power, net torque and specific fuel consumption measured according to ISO 9249 along with test bed data.
e) Calculation for determining the time for operating cycle.

i. Load the bucket to rated capacity over the maximum working range, swing through an angle of 90 degree, dump and return to dig.

ii. Hourly fuel consumption for the above operating cycle.

f) Detailed technical descriptions of each system of the Excavator.
g) Layout drawings and detailed description of all hydraulic systems and components.
h) Comprehensive commercial literature indicating therein complete technical specifications, the content of which must comply with ISO

7135.

i) Schematic and layout drawings, details of the supplier, number, function and type of Automatic Centralized Lubrication System.

j) Schematic and layout drawings and details of the Supplier, number, function and type of Automatic fire detection and suppression System.

k) Details of Equipment Health Monitoring System

l) Details of major bought-out assemblies and sub-assemblies indicating make, type, manufacturer's complete address etc.

m) Operation and Maintenance Manuals in accordance with ISO 6750, with copies in CDs as stipulated in clause A.3

10.3 Dimensions, Weights and Performance Details:

10.3.1 Working Ranges:

a) Maximum digging height (m)

b) Maximum digging reach (m)
c) Maximum digging depth (m)
d) Minimum dumping height (m)
e) Reach at maximum digging force (m)

10.3.2 Dimensions

10.3.2.1 Basic machine

a) Upper structure overall width (m)
b) Upper structure overall width, with catwalks (m)
c) Upper structure rear end swing radius (m)
d) Height to top of FOPS (m)
e) Clearance under upper structure (m)
f) Undercarriage overall width (m)
g) Crawler overall length (m)
h) Crawler tracks height (m)

10.3.2.2 Front End Attachment:

a) Bucket width (m)
b) Boom length with specified bucket (m)
c) Arm length with specified bucket (m)

10.3.3 Weights:

a) Shipping weight of all separate components (kg)
b) Bucket total weight (kg)
c) Bucket specific weight (kg/cum)
d) Weight of undercarriage (kg)
e) Total working weight (kg)

10.3.4 Performance details:

a) Swing speed (r / min)

b) Travel speed (m/sec)
c) Gradeability (%)

10.3.5 Engine:

a) Manufacturer and model
b) Number of cylinders
c) Bore (mm)
d) Stroke (mm)
e) Displacement (litre)
f) ISO net power at ..... r/min
g) Maximum torque at..... r/min (Nm)

10.3.6 Hydraulic system:

a) Make, Model, number, flow rates and operating pressures of pumps
b) Make, Model, number and ratings of motors
c) Make, Model, number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures (kPa)

10.3.7 Undercarriage:

a) Crawler width (m)
b) Crawler shoes width and total number
c) Centre to centre of idler roller and sprocket (m)
d) Ground contact area (sq.m)
e) Ground bearing pressure (kPa)
f) Load rollers, diameter and number per crawler
g) Driving sprocket diameter (m)
h) Idler roller diameter (m)

10.3.8 Electrical System:

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting details

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 10. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 10. A detrimental deviation of up to 2½% will be accepted

1	Cycle Time at 90 deg swing	To be tested at site after commissioning, under operating conditions as stated in the Tender. The equipment may be operated, at the Supplier's discretion, either by the Supplier's personnel (who are to be deployed for training as per contract) or by the Purchaser's personnel who are to be authorised by the Supplier.
2	Hourly Fuel Consumption	To be tested at site after on 30 (thirty) operating days' average immediately after commissioning under operating conditions as stated in the Tender. The equipment may be operated, at the Supplier's discretion, either by the Supplier's personnel (who are to be deployed for training as per contract) or by the Purchaser's personnel who are to be authorised by the Supplier.

3. Engine Net Power & RPM To be tested at Works/site as per ISO 9249. *(*Equipment manufacturer's Test data/report

5 CuM – 6CuM
DIESEL HYDRAULIC BACKHOE SHOVEL.

PART D:- EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATION OF DIESEL POWERED HYDRAULIC EXCAVATOR WITH BUCKET CAPACITY OF 5 *CuM – 6 CuM* BACKHOE SHOVEL.

1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-propelled, crawler mounted diesel powered hydraulic excavator with bucket capacity **OF 5 CuM– 6 CuM BACK HOE**

2. References

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867 Earth-moving machinery - Access systems

ISO 3457 Earth-moving machinery - Guards and shields - Definitions and specifications ISO 4557 Earth-moving machinery - Excavators - Operator's controls

ISO 6014 Earth-moving machinery - Determination of ground speed

ISO 6015 Earth-moving machinery - Hydraulic excavators - Methods of measuring tool forces

ISO 6405-1 Earth-moving machinery - Symbols for operator controls and other displays - Part 1: Common symbols

ISO 6405-2 Earth-moving machinery - Symbols for operator controls and other displays - Part 2: Specific symbols for machines, equipment and accessories

ISO 6682 Earth-moving machinery – Zones of comfort and reach for controls

ISO 6750 Earth-moving machinery - Operation and maintenance - Format and content of manuals

ISO 7135 Earth-moving machinery - Hydraulic excavators - Terminology and commercial specifications

ISO7451 Earth-moving machinery-Volumetric ratings for hydraulic excavator buckets and Backhoe loader buckets.

ISO 8643 Earth-moving machinery - Hydraulic excavator and back-hoe loader boom lowering control device - Requirements and tests

ISO 9249 Earth-moving machinery –Engine test code-Net power.

ISO 10265 Earth-moving machinery – Crawler machines – Performance requirements and test procedures for braking systems

ISO 10968 Earth-moving machinery – Operator' controls

ISO 3449 Earth-moving machinery -- Falling-object protective structures -- Laboratory tests and performance requirements

ISO 5006 Earth-moving machinery -- Operator's field of view -- Test method and performance criteria

Any other ISO specifications as may be applicable

3. Design Criteria

The excavator shall be capable of continuous digging for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive, blasted sandstone/rock having **average** density after blasting of 1,800 kg/m3.

The excavator shall be suitable for 2:1 heaped loading of Rear Dumpers of 60 T capacities.

3.1 Working Range

The excavator with Back Hoe Shovel attachment shall have the following working ranges:

a) Maximum digging height not less than 12.00 m
b) Maximum digging reach not less than 13.50 m
c) Maximum digging depth not less than 7.50 m
d) Maximum dumping height not less than 8.00 m

3.2 Operating Weight

The operating weight should not be less than 90000 kg.

The bucket digging force measured in accordance with ISO 6015 should be not less than 15000 kg/m of bucket width.

The ratio of arm or bucket digging force to operating weight should be equal to or less than

0.6. The equipment shall be meeting the stability requirement in all operating ranges.

4. Mechanical Specification:

4.1 Bucket:

The excavator shall be supplied with standard rock bucket, completely wear-plated to excavate sand stone abrasive rock having rock density (loose/blasted) of1800 kg/m3.

The backhoe bucket shall have capacity **of 5 CuM– 6 CuM** according to ISO 7451.

The specific weight of the steel used in construction of bucket shall be not less than 7800 kg/m3.

The tooth points supplied with the bucket shall be preferably hard faced and should have proper, durable, easily removable and shock absorbing type attachment with the bucket.

4.2 Front End Equipment:

The boom and arm should be a rugged durable construction of high strength steel and free from any stress concentrations. The design must take care of all forces i.e., bending, torsion, compression, etc. encountered during operation of the equipment. Sealed bearings / bushings should be provided at pivot points.

The bucket attachment connecting pins shall be sealed and lubricated.

4.3. Engine:

The excavator shall be powered by direct injection 4 -stroke turbo charged diesel engine delivering not less than 445 KW net power measured between 1700 rpm and 2200 rpm according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier II or equivalent or above standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of tender .Certificate for minimum EPA Tier II or equivalent or above from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.4 Hydraulic Drive System:

The excavator hydraulic system should be of proven design for efficient operations. The hydraulic pumps, motors, and cylinders should be field proven large heavy duty type and have suitable in-built protection from surge, cavitation, loss of oil due to hose leakage or burst, etc. As far as practicable reputable single make pumps, motors, cylinders and valves, etc. shall be used in the machine.

Adequate filtration of hydraulic oil shall be provided. The hydraulic tank preferably

be pressurized. An adequate and effective hydraulic oil cooling system shall also be provided.
All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing.

A boom lowering control system which complies with ISO 8643 shall be provided.

4.5 Swing System:

An independent hydraulic system should be provided for the swing motion.

Heavy duty Swing Circle with internal swing gear and pinion immersed in lubricant bath & dirt seals shall be provided. Swing Motor Brake should be provided

An upper structure swing lock/suitable arrangement to lock the upper structure shall be provided.

4.6 Propel and Steering:

Independent crawler drive with independent fail-safe braking system and hydraulically operated emergency and parking brakes which comply with ISO 10265 shall be provided.

4.7 Undercarriage:

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. It shall be of welded construction and stress relieved as required.

The sprocket should be a single piece / segmented type. Lifetime lubricated, idler and rollers, and a reliable track tensioning arrangement should be provided.

Crawler shoes shall be heavy duty and designed for ease of replacement whenever necessary.

4.8 Machinery House:

The excavator shall be provided with a machinery house/ suitable arrangement made of steel sheeting supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.

Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator's cab and service platforms and shall comply with ISO 2867.

4.9 Fuel Tank*:*

The fuel tank shall be of sufficient capacity to allow 16 hours operation without refueling and be provided with a level indicator and a lockable-hinged filler cap. The cap shall be fastened with tank with the help of suitable capacity chain/locking arrangement.
Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.10 Lubrication System:

A centralized PLC based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

4.11 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.11.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately

accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.11.2 Operator's Protective Structures:

Shovel shall be equipped with FOPS as per ISO –ISO3449. The ROPS shall also be provided if applicable as per ISO 3471/ ISO 12117-2

4.11.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.11.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

4.11.5 Starting and Stopping System:

Shovel shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.12 Gauges and Indicators/Electronic Display:

The following shall be provided:

a) Water temperature gauge
b) Engine oil pressure gauge/indicator
c) Fuel capacity gauge
d) Engine tachometer
e) Engine hour-meter
f) Low engine lube oil pressure indicator
g) Hydraulic oil level indicator
h) Air filter clogging indicator
i) Hydraulic Oil Temperature Gauge

In case any of these gauge(s) /indicator are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.13 Warning Alarms:

Warning alarm shall be provided for the following:

a) Radiator coolant level
b) Hydraulic oil level
c) Air cleaner element
d) Engine oil pressure
e) Engine water temperature
f) Hydraulic oil temperature
g) Fuel level
h) Microcomputer (if applicable)
i) Automatic lubrication
j) P.T.O lubrication

4.14 Electrical Equipment:

The excavator shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make
b) Reputed make Electric start motor
c) Reputable make high capacity maintenance free batteries
d) Battery isolation switch / relay.

All electrical circuits shall be protected by adequately rated fuses/MCBs, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance

4.15 Lighting:

Adequate flood lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. All lighting system shall be of LED type.

4.16 Guards and Shields:

Adequate guards and shields which comply with ISO 3457 shall be provided throughout the excavator.

4.17 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or

Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

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4.18 Fire Extinguishers:

An adequate number of fire extinguishers shall be provided at strategic points on the shovel, suitably mounted in heavy-duty brackets for ease of removal.

The extinguishers shall be both dry chemical powder (DCP type) and CO_2 type with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Fire Extinguishers, including Materials and Chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013**.**

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

4.19 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment.

a) All function cut off switch.
b) Hydraulic oil and air filter clogging indicators.
c) Swing Motor Brake.
d) Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire-resistant type.
e) Turbocharger guard.
f) Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
g) Vent valve, if applicable on top of hydraulic tank should be able to be removed without any tool.
h) A baffle plate between cold zone and hot zone
i) Provision for limiting of hydraulic cylinder
j) Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
k) Warning System for Operator Fatigue - Should comply as per requirement of Clause- 2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

5. Ancillary Equipment And Other Requirements:

The following are to be provided with the excavator:

a) Pressurized radiator cap with chain attachment.
b) Hydraulic jack 50T - 1 no.
c) Hydraulic pressure gauges with adopters, sockets suitable for checking Hyd. Pressure in the equipment
d) Torque Wrench/Torque Multiplier -1 no along with sockets applicable for the machine, especially for swing circle & counter weight.
e) Self-diagnostic and real time monitoring electronic tool
f) Multi meter for measuring electrical & electronic circuit values provided in the equipment

6.0 Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

I. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
II. Engine oil pressure
III. Coolant temperature
IV. Coolant level
V. Engine RPM
VI. Fuel level and fuel consumption rate
VII. Hyd. oil temperature and pressure
VIII. Hyd. Oil Level in the tank
IX. Engine electrical system - Battery voltage and Alternator out put
X. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Shovel Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
2. The real time interface telemetry port will be provided in the equipment
3. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
4. There shall be no additional requirement of any data converter for data

capturing like Analog to Digital and vice-versa etc.

5. There shall be integrated on board data management system as explained at point no.3 as above.
6. Permission to third party for interfacing, data collection through online port.
7. Signing of Non-disclosure agreement to protect intellectual property right on either side.
8. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
9. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

7. **Special Guarantees**

The following guarantee will apply for the different components from the accepted date of commissioning

a. Body, Chassis - 10,000 hours
b. Complete engine system - 8000 hours
c. Undercarriage - 5000 hrs
d. Hydraulic Pumps & motors - 6000 hrs
e. Hydraulic Cylinder Assembly - 6000 hrs
f. Electrical Items, 24V DC - 2000 hrs
g. Final Drive (Excluding Sprocket) & Steering System- 8000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of the subsidiary shall be final and binding for both supplier and purchaser.

8. Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 5000 (five thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for balance years of the contract period.

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

9. Expected life of major assemblies

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES (whichever is applicable)	EXPECTED LIFE* (in Hours)
Hydraulic Shovels	Prime Mover (Diesel)	
	Under carriage	
	Hydraulic pump	
	Hydraulic motor	
	Hydraulic Cylinders	
	Hydraulic control valve	
	Boom & Sticks	
	Bucket (Dipper)	
	Other Electrical items	

Note - * Expected life means life before first overhaul

10. Information to Be Provided by The Supplier:

The Supplier shall furnish the following information. All technical information shall be in SI units.

10.1 General:

a) Number of similar models supplied during the last five years.
The information shall be given in the following format and in the order of most recent first.

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

b) Details of tools to be provided with the equipment.
c) Details of erection programmes for the bid.

10.2 Technical Details:

a) Volumetric rating of the bucket according to ISO 7451 together with verification calculations and drawings (refer clause 4.1).
b) Maximum bucket and arm cylinder digging forces measured according to ISO 6015.
c) Schematic Drawing of the machine showing the position of the Center of Gravity and it's distance from the Central Axis of Rotation under the following operating conditions:
    i. Bucket at maximum digging force position with crawler tracks perpendicular to the face of the cut.
    ii. Bucket at maximum digging force position with crawler tracks parallel to the face of the cut.
d) Engine performance curves of net power, net torque and specific fuel consumption measured according to ISO 9249 along with test bed data.
e) Calculation for determining the time for operating cycle.
    i. Load the bucket to rated capacity over the maximum working range, swing through an angle of 90 degree, dump and return to dig.
    ii. Hourly fuel consumption for the above operating cycle.
f) Detailed technical descriptions of each system of the Excavator.
g) Layout drawings and detailed description of all hydraulic systems and components.
h) Comprehensive commercial literature indicating therein complete technical specifications, the content of which must comply with ISO 7135.
i) Schematic and layout drawings, details of the supplier, number, function and type of Automatic Centralized Lubrication System.
j) Schematic and layout drawings and details of the Supplier, number, function and type of Automatic fire detection and suppression System.
k) Details of Equipment Health Monitoring System
l) Details of major bought-out assemblies and sub-assemblies indicating make, type, manufacturer's complete address etc.
m) Operation and Maintenance Manuals in accordance with ISO 6750, with copies in CDs as stipulated in clause A.3

10.3 Dimensions, Weights and Performance Details:

10.3.1 Working Ranges:

a) Maximum digging height (m)
b) Maximum digging reach (m)
c) Maximum digging depth (m)

d) Minimum dumping height (m)
e) Reach at maximum digging force (m)

10.3.2 Dimensions

10.3.2.1 Basic machine

a) Upper structure overall width (m)
b) Upper structure overall width, with catwalks (m)
c) Upper structure rear end swing radius (m)
d) Height to top of FOPS (m)
e) Clearance under upper structure (m)
f) Undercarriage overall width (m)
g) Crawler overall length (m)
h) Crawler tracks height (m)

10.3.2.2 Front End Attachment:

a) Bucket width (m)
b) Boom length with specified bucket (m)
c) Arm length with specified bucket (m)

10.3.3 Weights:

a) Shipping weight of all separate components (kg)
b) Bucket total weight (kg)
c) Bucket specific weight (kg/cum)
d) Weight of undercarriage (kg)
e) Total working weight (kg)

10.3.4 Performance details:

a) Swing speed (r / min)
b) Travel speed (m/sec)
c) Gradeability (%)

10.3.5 Engine:

a) Manufacturer and model
b) Number of cylinders
c) Bore (mm)
d) Stroke (mm)
e) Displacement (litre)
f) ISO net power at ..... r/min
h) Maximum torque at..... r/min (Nm)

10.3.6 Hydraulic system:

a) Make, Model, number, flow rates and operating pressures of pumps
b) Make, Model, number and ratings of motors
c) Make, Model, number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures (kPa)

10.3.7 Undercarriage:

a) Crawler width (m)
b) Crawler shoes width and total number
c) Centre to centre of idler roller and sprocket (m)
d) Ground contact area (sq.m)
e) Ground bearing pressure (kPa)
f) Load rollers, diameter and number per crawler
g) Driving sprocket diameter (m)
h) Idler roller diameter (m)

10.3.8 Electrical System:

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting details

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 10. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 10. A detrimental deviation of up to 2½% will be accepted

1	Cycle Time at 90 deg swing	To be tested at site after commissioning, under operating conditions as stated in the Tender. The equipment may be operated, at the Supplier's discretion, either by the Supplier's personnel (who are to be deployed for training as per contract) or by the Purchaser's personnel who are to be authorised by the Supplier.
2	Hourly Fuel Consumption	To be tested at site after on 30 (thirty) operating days' average immediately after commissioning under operating conditions as stated in the Tender. The equipment may be operated, at the Supplier's discretion, either by the Supplier's personnel (who are to be deployed for training as per contract) or by the Purchaser's personnel who are to be authorised by the Supplier.
3. Engine Net Power & RPM ISO 9249.		To be tested at Works/site as per *(*Equipment manufacturer's Test data/report should be submitted.

Hydraulic Excavator
3.2-3.8 Cum (Back Hoe)

PART-D. EQUIPMENT SPECIFICATION OF DIESEL POWERED HYDRAULIC BACKHOE EXCAVATOR HAVING BUCKET CAPACITY IN THE RANGE OF 3.2 TO 3.8 CUM.

D.1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on site erection and commissioning of a self-propelled, crawler mounted, Diesel powered Hydraulic Excavator having Backhoe bucket of capacity in the range of 3.2 Cum to 3.8 Cum.

D.2. References

The following International Standards are referred to and form part of the specification: ISO

2867 Earth-moving machinery - Access system
ISO 3449 Earth-moving machinery - Falling Objects Protection Structure- Laboratory tests and performance requirements. This may be considered as ISO3449/IS10262
ISO 3457 Earth-moving machinery - Guard and Shields- Definitions and specification
ISO 6014 Earth-moving machinery - Determination of ground speed.
ISO 6015 Earth-moving machinery - Hydraulic Excavators - Methods of measuring tool forces.
ISO 6405-1 Earth-moving machinery - Symbols for operator controls and Displays - Part 1: Common symbols.
ISO 6405-2 Earth-moving machinery - Symbols for operator controls and displays - Part 2: Specific symbols for machines, equipment and accessories.
ISO 6750 Earth-moving machinery - Operation and Maintenance - Format and content of manuals.
ISO 7135 Earth-moving machinery - Hydraulic excavators - Terminology and commercial specification. **ISO 7451 Earth-moving machinery -** Volumetric ratings for hydraulic excavator buckets and backhoe loader buckets
ISO 8643 Earth-moving machinery - Hydraulic excavator and back-hoe loader boom lowering control - Requirements and tests.
ISO 4557 -Earth-moving machinery - Excavators - Operator's controls
ISO 6682 - Earth-moving machinery – Zones of comfort and reach for controls
ISO7546- Earth-moving Machinery-Volumetric ratings for hydraulic excavator buckets and Bottom discharge buckets.
ISO 10265- Earth-moving machinery – Crawler machines – Performance requirements and test procedures for braking systems
ISO 10968- Earth-moving machinery – Operator' controls
ISO 5006 Earth-moving machinery -- Operator's field of view -- Test method and performance criteria
ISO 3471 /ISO 12117-2 Earth-moving machinery -- Roll-over protective structures -- Laboratory tests and performance requirements
ISO-9249 Earth-moving machinery - Engine test code - Net power

Any other ISO specifications as may be applicable. The equivalent standards, if any, to any of the above ISO standards if offered are to be supported by documentary evidence in form of copies of equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

D.3. Design Criteria

The excavator shall be capable of continuous digging for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive blasted sandstone/ rock having a density after blasting of 1800 kg/ cum and in coal having a density after blasting of 1150 kg/ cum.

The excavator shall have the following working ranges:

a. Digging height- Equal or more than 10.0 meter
b. Digging reach - - Equal or more than 10.5 meter
c. Digging depth- - Equal or more than 7.0 meter
d. Dumping height- - Equal or more than 6.5 meter
e. The bucket cycle time of the offered equipment- - Equal or less than 30 second
f. The bucket digging force per meter of bucket width measured in accordance with ISO 6015-- Equal or more than 14,000 Kgf/m
g. The operating weight of the machine- - Equal or more than 54,000 Kg
h. Payload Capacity of offered equipment- Equal or more than 5760 Kg
(Minimum payload capacity of offered model of equipment will be calculated at the time of evaluation of offer as follows:-
Payload capacity = Offered Bucket Capacity X Density of material to be handle i.e. 1800 kg /cum.)

D.4. Technical Requirements

D.4.1 Dipper (Bucket):

The excavator shall be supplied with a hard faced, heavy duty rock backhoe bucket of capacity in the range of 3.2 Cum to 3.8 Cum rated according to ISO 7451. The tooth points to be supplied with the dipper shall also be hard faced and shall have proper, durable, easily removable and shock absorbing type attachment with the bucket.

D.4.2 Front End Equipment:

The boom and arm shall be rugged, durable construction of high strength impact resistant steel and free from any stress concentrations. The design must take care of all forces i.e. bending, torsion, compression etc. encountered during operation of the equipment. Sealed bearings shall be provided at pivot points. The bucket attachment connecting pins shall be sealed and lubricated.

D.4.3 Engine:

The excavator shall be powered by direct injection 4-stroke turbo charged suitable diesel engine delivering sufficient continuous output rating according to ISO 9249 compatible with the excavator requirement. The engine shall be provided with 24V electric starting, dry type 2-stage air cleaner with automatic dust evacuator and dust level indicator and two stage fuel-filters with water separator.

The engine shall have a coolant jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling coolant re-circulated through a heavy duty radiator. The system shall be capable of providing sufficient cooling to allow the excavator to continuously operate at the full rated output at the maximum ambient temperature.

The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling. The engine shall be equipped with an over-speed governor.

The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement

The engine should have Turbocharger guard. A baffle plate between cold and hot zone shall be provided.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier-II or equivalent standard or above standard certified / complied. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for minimum EPA Tier-II or equivalent standard or above standard from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

D.4.4 Hydraulic Drive System:

The excavator hydraulic system shall be directly powered by the engine for efficient operation of slew and Travel motors and the front end equipment. The hydraulic pumps, motors and cylinders shall be field proven large heavy duty type and have suitable in-built protection from surge, cavitation, loss of oil due to hose leakage or burst etc. As far as practicable reputable single make pumps, motors, cylinders and valves shall be used in the machine.

Adequate filtration of hydraulic oil with provision of warning alarm in case of filter clogging shall be provided. The hydraulic tank shall be preferably pressurized in order to ensure positive flow and to prevent surge and cavitation of the main pumps. An adequate and effective hydraulic oil cooling system shall also be provided. All hoses & piping shall be protected from damage. All hoses shall be heat resistant / heat retardant and grouped as far as possible and suitably clipped preferably with fiber clamps wherever possible, to reduce damage from scuffing.

A boom lowering control system which complies with ISO: 8643 shall be provided. Fire/heat resistant/retarder hydraulic hoses in place of ordinary hoses to decrease the change of fire. All the sleeves and conducts were cable/wire are passed shall be fire/heat resistant.

Provision for limiting of hydraulic cylinder stopper is to be provided. Vent valve on the top of

hydraulic tank shall be able to be removed without any tool.

D.4.5 Swing System:

An independent suitable hydraulic system shall be provided for swing motion. An upper structure swing lock shall be provided.

Heavy duty Swing Circle with internal swing gear and pinion immersed in lubricant bath & dirt seals shall be provided. Swing Motor Brake should be provided.

D.4.6 Propel and Steering:

An independent crawler drive with independent failsafe braking system and hydraulically operated Emergency and parking brakes which comply with ISO 10265 shall be provided.

D.4.7 Undercarriage:

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. It shall be of welded construction and stress relieved as required.

The sprocket shall be a single piece type. Lifetime lubricated sprocket, idler and rollers and a reliable track tensioning arrangement should be provided. Crawler shoe shall be heavy duty and designed for ease of replacement whenever necessary. *The weight of undercarriage shall preferably be 40 to 45% of the operating weight of the machine.*

D.4.8 Machinery House:

The excavator shall be provided with a dust proof machinery house made of steel sheeting supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.

Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, operator's cab and service platforms and shall comply with ISO 2867.

D.4.9 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed points, for all lubrication points on the equipment, except where use of high viscosity lubricants prevent the application of pumped system.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of automatic lubrication system shall be repeated on the instrument / test panel (specified elsewhere). Fire / heat resistant / retardant hydraulic hoses shall be provided in lubrication system.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling.

All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection and repairing. The lubrication lines to the boom point should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced.

Lubricants used shall be preferably of reputed Indian make

D.4.9 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

D.4.9.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

D.4.9.2 Operator's Protective Structures:

Shovel shall be equipped with FOPS as per ISO –ISO3449. The ROPS shall also be provided if applicable as per ISO 3471/ ISO 12117-2

D.4.9.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

D.4.9.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

D.4.9.5 Starting and Stopping System:

Shovel shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

D.4.10 Gauges & Indicators:

The following shall be provided as a minimum:

a. Coolant temperature gauge
b. Engine oil pressure gauge/ indicator
c. Fuel capacity gauge
d. Engine tachometer
e. Engine hour meter
f. Low engine lube oil pressure indicator
g. Hydraulic oil level indicator
h. Air filter clogging indicator
i. Hydraulic Oil Temperature Gauge

In case any of these gauge(s) /indicator are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

D.4.11 Warning Alarms:

Audio and / or visual warning alarm systems shall be provided for the following :
a. Low engine oil pressure
b. High coolant temperature
c. Alarm for failure of lubrication system
d. Engine oil level
e. Radiator coolant level
f. Hydraulic Oil level
g. Air cleaner restriction
h. Hydraulic oil temperature
i. Fuel level
j. Automatic lubrication
k. P.T.O. lubrication

D.4.12 Electrical Equipment:

The excavator shall be provided with the following :
a. 24V DC electrical system with suitably rated alternator of reputable make
b. Reputed make suitable capacity Electric starter motor
c. Reputable make High capacity Maintenance Free (Zero Maintenance i.e. no top up required during the course of battery life) batteries of reputed make.
d. Battery isolation/ cutoff switch.

All electrical circuits shall be protected by adequately rated fuses/MCB, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance. A ground level battery disconnect switch shall be provided. All electrical connectors shall be sealed to suppress entry of dust and moisture. Fire Resistant wiring should be provided in the Heat Zones.

D.4.13 Lightings:
Adequate flood lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. All lighting system shall be of LED type.

D.4.14 Guards & Shields:
Adequate guards and shields, which comply with ISO 3457, shall be provided throughout the excavator.
D.4.15 Fire Extinguisher

An adequate number of fire extinguishers shall be provided at all strategic points on the excavator, suitably mounted in heavy duty brackets for ease of removal. The extinguishers shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683. All material used in the fire-fighting systems shall be non-toxic and in no manner harmful to human beings during handling and use. The high pressure storage vessels and hoses, if used with fire- fighting systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the

date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Materials and Chemicals to be used in fire extinguisher duly tested from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

D.4.16 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

D.4.17 Fuel Tank

The fuel tank shall be of sufficient capacity for 16 hours operation without refueling, and be provided with a level indicator & vandalism protected lockable. Calculation showing sufficiency of capacity of fuel tank in respect of fuel consumption for the offered equipment is to be uploaded with the offer.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

D.4.18 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment.

a) All function cut off switch.

a) Hydraulic oil and air filter clogging indicators.

b) Swing Motor Brake.

c) Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.

d) Turbocharger guard.

e) Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

f) Vent valve, if applicable on top of hydraulic tank should be able to be removed without any tool.

g) A baffle plate between cold zone and hot zone

h) Provision for limiting of hydraulic cylinder

i) Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

j) Warning System for Operator Fatigue - Should comply as per requirement of Clause- 2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

D.4.19 Other Requirements:

The following are to be provided on the excavator:

a. Horn

b. Hydraulic oil level and air filter clogging indicators

c. Pressurized radiator cap with chain attachment.

d. Hydraulic jack 50T - 1 no

e. Hydraulic pressure gauges with adopters, sockets suitable for checking Hyd. Pressure in the equipment

f. Torque Wrench/Torque Multiplier -1 no along with sockets applicable for the machine, especially for swing circle & counter weight.

g. Self-diagnostic and real time monitoring electronic tool

h. Multi meter for measuring electrical & electronic circuit values provided in the equipment

D.4.20 Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

i. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
ii. Engine oil pressure & temperature
iii. Coolant temperature
iv. Coolant flow
v. Coolant level
vi. Engine RPM
vii. Fuel level and fuel consumption rate
viii. Hyd. oil temperature
ix. Hyd. Oil Level in the tank
x. Engine electrical system - Battery voltage and Alternator out put
xi. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to operator and to control room in case of catching fire. The

supplier shall provide the following:

A. There has to be one integrated single online port for capturing all the vital data.
B. The real time interface telemetry port will be provided in the equipment
C. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
D. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
E. There shall be integrated on board data management system as explained at point no.3 as above.
F. Permission to third party for interfacing, data collection through online port.
G. Signing of Non-disclosure agreement to protect intellectual property right on either side.
H. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
I. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator

D.5 Performance Guarantee:

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 5000 (five thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for balance period of the contract.

[[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

D.6 Special Guarantees:

The following guarantee will apply for the different components from the accepted date of commissioning:

i. Main frame/Body Chassis - 10000 Working hours.
ii. Complete Engine system – 8000 working hours.
iii. Hydraulic Pumps & motors- 8000 Working hours
iv. Final drive (excluding sprocket) & Steering System - 8000 working hours
v. Hydraulic Cylinders: 8000 Working hours
vi. **Undercarriage** -5000 Working hours

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

D.7 Expected life of major assemblies: Bidder is to upload authenticated scanned document of the expected life (In terms of working hours) of the following major assemblies / sub-assemblies.

a. Dipper
b. Boom & Arm
c. Pumps
d. Motors
e. Cylinders

f. Swing system
g. Propel system
h. Under carriage
i. Lubrication system
j. Engine
k. Hydraulic Control Valve

Note - Expected life means life before first overhaul.

D.8 Equipment acceptance:

The equipment ordered will be finally accepted subject to the bidder demonstrating to the purchaser or its authorized representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random) by the purchaser when tested as indicated below, meets the performance data provided by the supplier in accordance with requirements . In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturers Certified test copy for that parameter of performance data provided by the supplier in accordance with requirements. A detrimental deviation of up to 2½% will be accepted.

D.8.1 Cycle Time at 90° swing:

To be tested at site after commissioning under operating conditions as stated in the contract.
The equipment may be operated at the Supplier's discretion, either by the Supplier's personnel, who are to be deployed for training as per contract or by the purchaser's personnel who are to be authorized by the Supplier.

D.8.2 Hourly Fuel Consumption:

To be tested at site on 30(thirty) - operating days' average after commissioning under operating conditions as stated in the contract. The equipment may be operated at the Supplier's discretion, either by the Supplier's personnel, who are to be dropped for training as per contract or by the purchaser's personnel who are to be authorized by the Supplier.

D.8.3. Digging Forces:

To be tested at works or at site to be mutually decided at the final stage of order. Detrimental deviation of up to 2.5% as mentioned in technical specification by the bidder.

D.9 Information to be provided by the supplier:

The supplier must furnish the following information. All technical information shall be in SI units.

Dimensions, Weights and Performance Details - The bidder has to submit the values / details against following clause for offered equipment

D.9.1	**Working Ranges-**
	a. Maximum digging height
	b. Maximum digging reach
	c. Maximum digging depth
	d. Minimum dumping height
	e. Reach at maximum digging force
D.9.2	**Basic Dimensions-**
	a. Upper structure overall width
	b. Upper structure overall width, with catwalk
	c. Upper structure rear end swing radius
	d. Height to top of FOPS Cabin
	e. Clearance under upper structure
	f. Undercarriage overall width
	g. Crawler overall length
	h. Crawler tracks height
D.9.3	**Front end:**
	a. Bucket width
	b. Boom length with specified bucket
	c. Arm length with specified bucket
D.9.4	**Machine Weights:**
	a. Shipping weights of all separate components (Kg)
	b. Bucket total weight
	c. Specific weight of steel used in the Bucket
	d. Weight of undercarriage
	e. Total working weight
D.9.5	**Performance details-**
	a. Swing speed
	b. Travel speed
	c. Grade ability
	d. Swing time for 90° with loaded bucket
	e. Swing time for 90° with empty bucket
D.9.6	**Engine**
	a. Manufacturer and model
	b. Number of cylinders
	c. Bore dia (in mm)
	d. Stroke Length (in mm)
	e. Displacement (in Liter)
	f. net power (max^m) (HP) at .....r / min as per ISO 9249
	g. Maximum torque at (Nm) .....r / min as per ISO 9249

	h. ECM make, version and features
	i. Model year
	j. Specific Fuel Consumption (SFC) as per Engine Performance Curve complying with ISO:9249 (gm/ kw-hr)
D.9.7	**Hydraulic System**
	a. Make & Model of Pumps
	b. Type of Pumps
	c. Number of Pumps
	d. Flow rate of Pumps (Litre/min)
	e. Operating pressures of Pumps (kg/sq. cm)
	f. Make & Model of Hydraulic Motors
	g. Type of Motors
	h. Number of Hydraulic Motors
	i. Rating of Hydraulic Motors
	j. Make & Model of Hydraulic Cylinders
	k. Number of Hydraulic Cylinders
	l. Piston Diameters of Hydraulic Cylinders (mm)
	m. Stroke Length of Hydraulic Cylinders (mm)
	n. Relief valve operating pressures
	o. Operating pressures of all systems (kPa)
	p. Oil quantity in system (litres)
	q. Oil quantity in tank (litres)
	r. Filtration system type & rating
D.9.8	**Undercarriage**
	a. Crawler width
	b. Crawler shoe type
	c. Crawler shoe number per track
	d. Crawler shoes, total number
	e. Center to center of sprockets and idler roller
	f. Ground contact area
	g. Ground bearing pressure
	h. Load Rollers diameter
	i. Load Rollers, number per crawler
	j. Driving Sprocket, diameter
	k. Front Idler Roller, diameter

D.9.9	**Electrical System**
	a. Starter make, model and rating
	b. Starter control make and model
	c. Alternator make, model and rating
	d. Batteries numbers, Make and rating (Ah & CCA)
	e. Lighting details
D.9.10	**Circle gear and roller path**
	a. Swing gear pitch diameter
	b. Width of teeth
	c. Roller path diameter
	d. Number of Rollers
	e. Diameter of Rollers
D.9.11	**General**
	a. Details, number and location of fire extinguishers
	b. Make, Model and Operating range of all gauges/ indicators
	c. Make, Model of all warning alarms

Document to be uploaded by bidder:-

1	List of tools covered in Comprehensive tool kit along with quantity required for general Maintenance and repair.
2	List of Special Tools if required for erection and commissioning of Equipment.
3	A Self certificate to the effect that any other tool if required over and above the list of comprehensive tool kit and special tool, shall be supplied by the bidder at no cost to purchaser during the contract period
4	A self-certificate to the effect that the offered equipment will work and perform satisfactorily in the Geographical and climatic conditions as mentioned in the NIT
5	Details of major bought-out items including Air-Conditioner etc. indicating manufacturer name with their complete address.
6	Self-Certificate with respect to all major components other than items identified / mentioned in Major bought out items list, are manufactured by the bidder in their works
7	List of Spare parts & Consumables including refrigerant & coolant (per equipment wise), required for operation of equipment during warranty period.
8	List of Spare Parts and Consumables including refrigerant & coolant for balance years period beyond the warranty period of the equipment per year per equipment wise

9	Schedule of use of all necessary oils, lubricants, coolant, greases etc. for the operation and maintenance of the equipment, estimated annual consumption and appropriate international standard / brand name or the brand name and reference number of equivalents available in India.
10	Details of Schedule of Maintenance indicating time required for accomplishing each of the maintenance task.
11	Quality Assurance Plan for various stages of manufacture.
12	Copy of valid certificate, valid as on date of opening of tender substantiating compliance with an internationally recognized Quality Assurance Standard.
14	To upload an undertaking to maintain after sales service throughout the life of equipment.
15	Detailed description of Engine provided with offered Hydraulic backhoe.
16	Self-Certificate for meeting emission norms of minimum EPA tire II or equivalent along with test data / report issued by competent authority in this respect.
17	Detailed list of instrumentation, monitoring and alarm systems.
18	Details with location of Warning Alarms.
19	Details with location of Gauges & Indicators.
20	Lighting details showing quantity, wattage and other details of lights provided in offered model of equipment.
21	**Fire Extinguisher:** Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Material and Chemical used in fire extinguisher duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
22	**AUTO FIRE DETECTION AND SUPPRESSION SYSTEM:** Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along-with other documents, for Material and Chemical used in fire suppression system duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
23	Bidder is to upload authenticated scanned document of expected life in terms of working hours of the major assemblies.
24	List of number of offered model of equipment (as per provision of proven criteria) supplied in past in the format given.
25	Details of nearest Depot / warehouse and service facilities given in the format given.
26	Details of erection program for the bid as per CLAUSE No. C.10.1.c of TPS.
27	Volumetric rating of the bucket according to ISO 7451 together with verification calculations and drawings.
28	Maximum bucket and arm cylinder digging forces measured according to ISO 6015.
29	Schematic Drawing of the machine showing the position of the Center of Gravity and its distance from the Central Axis of Rotation under the following operating conditions: i. Bucket at maximum digging force position with crawler tracks perpendicular to the

	face of the cut. ii. Bucket at maximum digging force position with crawler tracks parallel to the face of the cut.
30	Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO: 9249. Engine Performance curve must indicate model of the offered backhoe excavator & engine.
31	i. Calculation for determining the total time for operating cycle. ii. Hourly fuel consumption for operating cycle. [**Operating Cycle**- Load the bucket to rated capacity over the maximum working range, swing through an angle of 90 degree, dump and return to dig.]
32	Detailed technical descriptions and specifications of each system of the offered backhoe excavator.
33	Layout drawings and detailed technical descriptions of all hydraulic systems and components including all information of pumps, motors and cylinders.
34	Comprehensive commercial literature indicating therein complete technical specifications, the content of which must comply with ISO 7135.
35	Detailed description with Schematic drawings of Automatic Lubrication System indicating the details of the supplier, number, type and its function.
36	Detailed technical description of Electronic Control Module used , Diagnostic Tool's feature and Equipment Health Monitoring System with Data Logging Units provided with offered excavator.
37	Schematic and layout drawings of Automatic fire detection and suppression System with complete details of supplier, function, type and location of area covered by nozzles.
38	Calculation showing sufficiency of capacity of fuel tank in respect of fuel consumption for the offered equipment.
39	To upload authenticated scanned documents chronologically and in tabular form of "General Information, Dimension, Weight and Performance Details" as mentioned in CLAUSE D.9 and all its sub-clauses
40	To upload an undertaking that the offered equipment shall complies all the safety provision and devices as per the Gazette Notification 2018 as well as DGMS Circular 06 Dated 27.02.2020.

FORMAT FOR PAST SUPPLY

Company / User Mine Name	**Mine Name & its type where the equipment is deployed**	**Complete Address of Company / user mine**	**Contract No. and Date**	**Phone no.* / Mobile No.***	**Fax No*.**	**E-Mail ID***	**Name of contact person**	**Sl. No. of machines**	**Model**	**Commissioning Date**

*Should be recent and active for getting information during tendering process and afterwards.

FORMAT FOR MAJOR DEPOT / WARE HOUSE

Major Depot / Warehouse			Service Facility		
Location with complete address	**Contact Nos.**	**Inventory Value (Approx.)**	**Location with complete address**	**Type of facility available**	**No. of Engineers***

***Engineers / Technicians employed to service the equipment either at the facility or on-site.**

Hydraulic Excavator
1.5 Cum (Back Hoe)

EQUIPMENT SPECIFICATION OF DIESEL POWERED HYDRAULIC BACKHOE EXCAVATOR HAVING BUCKET CAPACITY IN THE RANGE OF NOT LESS THAN 1.5 CUM.

D.1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on site erection and commissioning of a self-propelled, crawler mounted, Diesel powered Hydraulic Excavator having Backhoe bucket of capacity not less than 1.5 Cum.

D.2. References

The following International Standards are referred to in, and form part of, the

specification: ISO 2867 Earth-moving machinery - Access system
ISO 3449 Earth-moving machinery - Falling Objects Protection Structure- Laboratory tests and performance requirements. This may be considered as ISO3449/IS10262
ISO 3457 Earth-moving machinery - Guard and Shields- Definitions and specification
ISO 6014 Earth-moving machinery - Determination of ground speed.
ISO 6015 Earth-moving machinery - Hydraulic Excavators - Methods of measuring tool forces.
ISO 6405-1 Earth-moving machinery - Symbols for operator controls and displays - Part 1 : Common symbols.
ISO 6405-2 Earth-moving machinery - Symbols for operator controls and displays - Part 2 : Specific symbols for machines, equipment and accessories.
ISO 6750 Earth-moving machinery - Operation and Maintenance - Format and content of manuals.
ISO 7135 Earth-moving machinery - Hydraulic excavators - Terminology and commercial specification. **ISO 7451 Earth-moving machinery -** Volumetric ratings for hydraulic excavator buckets and backhoe loader buckets
ISO 8643 Earth-moving machinery - Hydraulic excavator and back-hoe loader boom lowering control - Requirements and tests.
ISO 4557 -Earth-moving machinery - Excavators - Operator's controls
ISO 6682 - Earth-moving machinery – Zones of comfort and reach for controls
ISO7546- Earth-moving Machinery-Volumetric ratings for hydraulic excavator buckets and Bottom discharge buckets.
ISO 10265- Earth-moving machinery – Crawler machines – Performance requirements and test procedures for braking systems
ISO 10968- Earth-moving machinery – Operator' controls
ISO 5006 Earth-moving machinery -- Operator's field of view -- Test method and performance criteria
ISO 3471 /ISO 12117-2 Earth-moving machinery -- Roll-over protective structures -- Laboratory tests and performance requirements
ISO-9249 Earth-moving machinery - Engine test code - Net power

Any other ISO specifications as may be applicable. The equivalent standards, if any, to any of the above ISO standards if offered are to be supported by documentary evidence in form of copies of equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

D.3. Design Criteria

The excavator shall be capable of continuous digging for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive blasted sandstone/ rock having density after blasting of 1800 kg/ cum and in coal having a density after blasting of 1150 kg/ cum.

The excavator shall have the following working ranges:

i. Digging height- Equal or more than 9.0 meter
j. Digging reach - - Equal or more than 9.0 meter
k. Digging depth- - Equal or more than 6.0 meter
l. Dumping height- - Equal or more than 6.0 meter
m. The operating weight of the machine- - Equal or more than 30,000 Kg
n. Payload Capacity of offered equipment- Equal or more than 2160 Kg (Minimum payload capacity of offered model of equipment will be calculated at the time of evaluation of offer as follows:-
Payload capacity = Offered Bucket Capacity X Density of material to be handle i.e. 1800 kgs /cum.)

D.4. Technical Requirements

D.4.1 Dipper (Bucket):

The excavator shall be supplied with a hard faced, heavy duty rock backhoe bucket of capacity not less than 1.5 Cum rated according to ISO 7451. The tooth points to be supplied with the dipper shall also be hard faced and shall have proper, durable, easily removable and shock absorbing type attachment with the bucket.

D.4.2 Front End Equipment:

The boom and arm shall be rugged, durable construction of high strength impact resistant steel and free from any stress concentrations. The design must take care of all forces i.e. bending, torsion, compression etc. encountered during operation of the equipment. Sealed bearings shall be provided at pivot points. The bucket attachment connecting pins shall be sealed and lubricated.

D.4.3 Engine:

The excavator shall be powered by direct injection 4-stroke turbo charged suitable diesel engine delivering sufficient continuous output rating according to ISO 9249 compatible with the excavator requirement. The engine shall be provided with 24V electric starting, dry type 2-stage air cleaner with automatic dust evacuator and dust level indicator and two stage fuel-filters with water separator.

The engine shall have a coolant jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling coolant re-circulated through a heavy duty radiator. The system shall be capable of providing sufficient cooling to allow the excavator to continuously

operate at the full rated output at the maximum ambient temperature. The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling. The engine shall be equipped with an over-speed governor.
The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement

The engine should have Turbocharger guard. A baffle plate between cold and hot zone shall be provided.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier-II or equivalent standard or above standard certified / complied. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for minimum EPA Tier-II or equivalent standard or above standard from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

D.4.4 Hydraulic Drive System:

The excavator hydraulic system shall be directly powered by the engine for efficient operation of slew and travel motors and the front end equipment. The hydraulic pumps, motors and cylinders shall be field proven large heavy duty type and have suitable in-built protection from surge, cavitation, loss of oil due to hose leakage or burst etc. As far as practicable reputable single make pumps, motors, cylinders and valves shall be used in the machine. Adequate filtration of hydraulic oil with provision of warning alarm in case of filter clogging shall be provided. The hydraulic tank shall be preferably pressurized in order to ensure positive flow and to prevent surge and cavitation of the main pumps. An adequate and effective hydraulic oil cooling system shall also be provided.

All hoses & piping shall be protected from damage. All hoses shall be heat resistant / heat retardant and grouped as far as possible and suitably clipped preferably with fiber clamps wherever possible, to reduce damage from scuffing.

A boom lowering control system which complies with ISO: 8643 shall be provided. Fire/heat resistant/retarder hydraulic hoses in place of ordinary hoses to decrease the change of fire. All the sleeves and conducts were cable/wire are passed shall be fire/heat resistant.
Provision for limiting of hydraulic cylinder stopper is to be provided. Vent valve on the top of

hydraulic tank shall be able to be removed without any tool.

D.4.5 Swing System:

An independent suitable hydraulic system shall be provided for swing motion. An upper structure swing lock shall be provided.

Heavy duty Swing Circle with internal swing gear and pinion immersed in lubricant bath & dirt seals shall be provided. Swing Motor Brake should be provided.

D.4.6 Propel and Steering:

An independent crawler drive with independent failsafe braking system and hydraulically operated emergency and parking brakes which comply with ISO 10265 shall be provided.

D.4.7 Undercarriage:

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. It shall be of welded construction and stress relieved as required.

The sprocket shall be a single piece type. Lifetime lubricated sprocket, idler and rollers and a reliable track tensioning arrangement should be provided. Crawler shoe shall be heavy duty and designed for ease of replacement whenever necessary. The weight of undercarriage shall preferably be 40 to 45% of the operating weight of the machine.

D.4.8 Machinery House:

The excavator shall be provided with a dust proof machinery house made of steel sheeting supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.

Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, operator's cab and service platforms and shall comply with ISO 2867.

D.4.9 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed points, for all lubrication points on the equipment, except where use of high viscosity lubricants prevent the application of pumped system.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of automatic lubrication system shall be repeated on the instrument / test panel (specified elsewhere). Fire / heat resistant / retardant hydraulic hoses shall be provided in lubrication system.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling.

All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection and repairing. The lubrication lines to the boom point should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate

in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced.

Lubricants used shall be preferably of reputed Indian make

D.4.10 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

D.4.10.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

D.4.10.2 Operator's Protective Structures:

Shovel shall be equipped with FOPS as per ISO –ISO3449. The ROPS shall also be provided

if applicable as per ISO 3471/ ISO 12117-2

D.4.10.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

D.4.10.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

D.4.10.5 Starting and Stopping System:

Shovel shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

D.4.11 Gauges & Indicators:
The following shall be provided as a minimum:
a. Coolant temperature gauge
b. Engine oil pressure gauge/ indicator
c. Fuel capacity gauge
d. Engine tachometer
e. Engine hour meter
f. Low engine lube oil pressure indicator
g. Hydraulic oil level indicator
h. Air filter clogging indicator
i. Hydraulic Oil Temperature Gauge
In case any of these gauge(s) /indicator are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

D.4.12 Warning Alarms :

Audio and / or visual warning alarm systems shall be provided for the following :
a. Low engine oil pressure
b. High coolant temperature
c. Alarm for failure of lubrication system
d. Engine oil level
e. Radiator coolant level
f. Hydraulic Oil level
g. Air cleaner restriction
h. Hydraulic oil temperature
i. Fuel level
j. Automatic lubrication
k. P.T.O. lubrication

D.4.13 Electrical Equipment:
The excavator shall be provided with the following:
a. 24V DC electrical system with suitably rated alternator of reputable make
b. Reputed make suitable capacity Electric starter motor
c. Reputable make High capacity Maintenance Free (Zero Maintenance i.e. no top up required during the course of battery life) batteries of reputed make.
d. Battery isolation/ cutoff switch.

All electrical circuits shall be protected by adequately rated fuses/MCB, which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance. A ground level battery disconnect switch shall be provided. All electrical connectors shall be sealed to suppress entry of dust and moisture. Fire Resistant wiring should be provided in the Heat Zones.

D.4.14 Lightings:

Adequate flood lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. All lighting system shall be of LED type.

D.4.15 Guards & Shields:

Adequate guards and shields, which comply with ISO 3457, shall be provided throughout the excavator.

D.4.16 Fire Extinguisher

An adequate number of fire extinguishers shall be provided at all strategic points on the excavator, suitably mounted in heavy duty brackets for ease of removal. The extinguishers shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683. All material used in the fire-fighting systems shall be non-toxic and in no manner harmful to human beings during handling and use. The high pressure storage vessels and hoses, if used with fire- fighting systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Materials and Chemicals to be used in fire extinguisher duly tested from any Government or Government approved Laboratory in

compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

D.4.17 Automatic Fire Detection and Suppression System (AFDSS):

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

D.4.18 Fuel Tank

The fuel tank shall be of sufficient capacity for 16 hours operation without refueling, and be provided with a level indicator & vandalism protected lockable. Calculation showing sufficiency of capacity of fuel tank in respect of fuel consumption for the offered equipment is to be uploaded with the offer.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

D.4.19 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment.

k) All function cut off switch.
l) Hydraulic oil and air filter clogging indicators.
m) Swing Motor Brake.
n) Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
o) Turbocharger guard.
p) Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
q) Vent valve, if applicable on top of hydraulic tank should be able to be removed without any tool.
r) A baffle plate between cold zone and hot zone
s) Provision for limiting of hydraulic cylinder
t) Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
u) Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

D.4.20 Other Requirements:

The following are to be provided on the excavator:

a. Horn
b. Hydraulic oil level and air filter clogging indicators
c. Pressurized radiator cap with chain attachment.
d. Hydraulic jack 50T - 1 no
e. Hydraulic pressure gauges with adopters, sockets suitable for checking Hyd. Pressure in the equipment
f. Torque Wrench/Torque Multiplier -1 no along with sockets applicable for the machine, especially for swing circle & counter weight.
g. Self-diagnostic and real time monitoring electronic tool
h. Multi meter for measuring electrical & electronic circuit values provided in the equipment

D.4.21 Productivity & Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following items:

i. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
ii. Engine oil pressure & temperature
iii. Coolant temperature
iv. Coolant flow
v. Coolant level
vi. Engine RPM
vii. Fuel level Hyd. oil temperature
viii. Hyd. Oil Level in the tank
ix. Engine electrical system - Battery voltage and Alternator out put
x. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Shovel Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

A. There has to be one integrated single online port for capturing all the vital data.
B. The real time interface telemetry port will be provided in the equipment
C. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
D. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
E. There shall be integrated on board data management system as explained at point no.3 as above.
F. Permission to third party for interfacing, data collection through online port.
G. Signing of Non-disclosure agreement to protect intellectual property right on either side.
H. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
I. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator

D.5 Performance Guarantee:

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 4500 (Four thousand five hundred) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning .

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

D.6 Special Guarantees:

The following guarantee will apply for the different components from the accepted date of commissioning:

i. Main frame/Body Chassis - 10000 Working hours.
ii. Complete Engine system – 8000 working hours.
iii. Hydraulic Pumps & motors- 8000 Working hours
iv. Final drive (excluding sprocket) & Steering System - 8000 working hours
v. Hydraulic Cylinders: 8000 Working hours
vi. Undercarriage- 5000 Working hours

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C.6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C.6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

D.6 Expected life of major assemblies: Bidder is to upload authenticated scanned document of the expected life (In terms of working hours) of the following major assemblies / sub-assemblies.

a. Dipper
b. Boom & Arm
c. Pumps
d. Motors
e. Cylinders
f. Swing system
g. Propel system
h. Under carriage
i. Lubrication system
j. Engine

k. Hydraulic Control Valve

Note - Expected life means life before first overhaul

D.7 Equipment acceptance:

The equipment ordered will be finally accepted subject to the bidder demonstrating to the purchaser or its authorized representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random) by the purchaser when tested as indicated below, meets the performance data provided by the supplier in accordance with requirements. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturers Certified test copy for that parameter of performance data provided by the supplier in accordance with requirements. A detrimental deviation of up to 2½% will be accepted.

D.7.1 Cycle Time at 90° swing:

To be tested at site after commissioning under operating conditions as stated in the contract. The equipment may be operated at the Supplier's discretion, either by the Supplier's personnel, who are to be deployed for training as per contract or by the purchaser's personnel who are to be authorized by the Supplier.

D.7.2 Hourly Fuel Consumption:

To be tested at site on 30(thirty) - operating days' average after commissioning under operating conditions as stated in the contract. The equipment may be operated at the Supplier's discretion, either by the Supplier's personnel, who are to be dropped for training as per contract or by the purchaser's personnel who are to be authorized by the Supplier.

D.7.3. Digging Forces:

To be tested at works or at site to be mutually decided at the final stage of order.
Detrimental deviation of up to 2.5% as mentioned by the bidder.

D.9 Information to be provided by the supplier:

The supplier must furnish the following information. All technical information shall be in SI units

Dimensions, Weights and Performance Details - The bidder has to submit the values / details against following clause for offered equipment

D.9.1	**Working Ranges-**
	f. Maximum digging height
	g. Maximum digging reach
	h. Maximum digging depth
	i. Minimum dumping height
	j. Reach at maximum digging force
D.9.2	**Basic Dimensions-**
	j. Upper structure overall width
	k. Upper structure overall width, with catwalk
	l. Upper structure rear end swing radius

	m. Height to top of FOPS Cabin
	n. Clearance under upper structure
	o. Undercarriage overall width
	p. Crawler overall length
	q. Crawler tracks height
D.9.3	**Front end:**
	d. Bucket width
	e. Boom length with specified bucket
	f. Arm length with specified bucket
D.9.4	**Machine Weights:**
	f. Shipping weights of all separate components (Kg)
	g. Bucket total weight
	h. Specific weight of steel used in the Bucket
	i. Weight of undercarriage
	j. Total working weight
D.9.5	**Performance details-**
	f. Swing speed
	g. Travel speed
	h. Grade ability
	i. Swing time for 90° with loaded bucket
	j. Swing time for 90° with empty bucket
D.9.6	**Engine**
	k. Manufacturer and model
	l. Number of cylinders
	m. Bore dia (in mm)
	n. Stroke Length (in mm)
	o. Displacement (in Liter)
	p. net power (max^m) (HP) at .....r / min as per ISO 9249
	q. Maximum torque at (Nm) .....r / min as per ISO 9249
	r. ECM make, version and features
	s. Model year
	t. Specific Fuel Consumption (SFC) as per Engine Performance Curve complying with ISO:9249 (gm/ kw-hr)
D.9.7	**Hydraulic System**
	a. Make & Model of Pumps
	b. Type of Pumps
	c. Number of Pumps
	d. Flow rate of Pumps (Litre/min)
	e. Operating pressures of Pumps (kg/sq. cm)

	f. Make & Model of Hydraulic Motors
	g. Type of Motors
	h. Number of Hydraulic Motors
	i. Rating of Hydraulic Motors
	j. Make & Model of Hydraulic Cylinders
	k. Number of Hydraulic Cylinders
	l. Piston Diameters of Hydraulic Cylinders (mm)
	m. Stroke Length of Hydraulic Cylinders (mm)
	n. Relief valve operating pressures
	o. Operating pressures of all systems (kPa)
	p. Oil quantity in system (litres)
	q. Oil quantity in tank (litres)
	r. Filtration system type & rating
D.9.8	**Undercarriage**
	l. Crawler width
	m. Crawler shoe type
	n. Crawler shoe number per track
	o. Crawler shoes, total number
	p. Center to center of sprockets and idler roller
	q. Ground contact area
	r. Ground bearing pressure
	s. Load Rollers diameter
	t. Load Rollers, number per crawler
	u. Driving Sprocket, diameter
	v. Front Idler Roller, diameter
D.9.9	**Electrical System**
	f. Starter make, model and rating
	g. Starter control make and model
	h. Alternator make, model and rating
	i. Batteries numbers, Make and rating (Ah & CCA)
	j. Lighting details
D.9.10	**Circle gear and roller path**
	f. Swing gear pitch diameter
	g. Width of teeth

	h. Roller path diameter
	i. Number of Rollers
	j. Diameter of Rollers
D.9.11	**General**
	d. Details, number and location of fire extinguishers
	e. Make, Model and Operating range of all gauges/ indicators
	f. Make, Model of all warning alarms

Document to be uploaded by bidder:-

1. List of tools covered in Comprehensive tool kit along with quantity required for general Maintenance and repair.

2. List of Special Tools if required for erection and commissioning of Equipment.

3. A Self certificate to the effect that any other tool if required over and above the list of comprehensive tool kit and special tool, shall be supplied by the bidder at no cost to purchaser during the contract period.

4. A self-certificate to the effect that the offered equipment will work and perform satisfactorily in the Geographical and climatic conditions as mentioned in CLAUSE No. C.1.

5. Details of major bought-out items including Air-Conditioner etc. indicating manufacturer name with their complete address.

6. Self-Certificate with respect to all major components other than items identified / mentioned in Major bought out items list are manufactured by the bidder in their works exclusively.

7. List of Spare parts & Consumables including refrigerant & coolant (per equipment wise), required for operation of equipment during warranty period.

8. List of Spare Parts and Consumables including refrigerant & coolant for balance years period beyond the warranty period of the equipment per year per equipment wise.

9. Schedule of use of all necessary oils, lubricants, coolant, greases etc. for the operation and maintenance of the equipment, estimated annual consumption and appropriate international standard / brand name or the brand name and reference number of equivalents available in India as per CLAUSE No. C.6.5.

10. Details of Schedule of Maintenance indicating time required for accomplishing each of the maintenance task.

11. Quality Assurance Plan for various stages of manufacture.

12. Copy of valid certificate, valid as on date of opening of tender substantiating compliance with an internationally recognized Quality Assurance Standard.

13. To upload an undertaking to maintain after sales service throughout the life of equipment.

15. Detailed description of Engine provided with offered Hydraulic backhoe.

16. Self-Certificate for meeting emission norms of minimum EPA tire II or equivalent or above along with test data / report issued by competent authority in this respect.

17. Detailed list of instrumentation, monitoring and alarm systems.

18. Details with location of Warning Alarms.

19. Details with location of Gauges & Indicators.

20. Lighting details showing quantity, wattage and other details of lights provided in offered model of equipment.

21. **Fire Extinguisher**: Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Material and Chemical used in fire extinguisher duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).

22. **AUTO FIRE DETECTION AND SUPPRESSION SYSTEM**: Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along-with other documents, for Material and Chemical used in fire suppression system duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).

23. Bidder is to upload authenticated scanned document of expected life in terms of working hours of the major assemblies.

24. List of number of offered model of equipment (as per provision of proven criteria) supplied in past in the format given.

25. Details of nearest Depot / warehouse and service facilities given in the format given.

26. Details of erection program for the bid.

27. Volumetric rating of the bucket according to ISO 7451 together with verification calculations and drawings.

28. Maximum bucket and arm cylinder digging forces measured according to ISO 6015.

29. Schematic Drawing of the machine showing the position of the Center of Gravity and its distance from the Central Axis of Rotation under the following operating conditions:

i. Bucket at maximum digging force position with crawler tracks perpendicular to the face of the cut.
ii. Bucket at maximum digging force position with crawler tracks parallel to the face of the cut.

30. Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO: 9249. Engine Performance

curve must indicate model of the offered backhoe excavator & engine.

31a. Calculation for determining the total time for operating cycle.
ii. Hourly fuel consumption for operating cycle.
[Operating Cycle- Load the bucket to rated capacity over the maximum working range, swing through an angle of 90 degree, dump and return to dig.]

32. Detailed technical descriptions and specifications of each system of the offered backhoe excavator.

33. Layout drawings and detailed technical descriptions of all hydraulic systems and components including all information of pumps, motors and cylinders.

34. Comprehensive commercial literature indicating therein complete technical specifications, the content of which must comply with ISO 7135.

35. Detailed description with Schematic drawings of Automatic Lubrication System indicating the details of the supplier, number, type and its function.

36. Detailed technical description of Electronic Control Module used, Diagnostic Tool's feature and Equipment Health Monitoring System with Data Logging Units provided with offered excavator.

37. Schematic and layout drawings of Automatic fire detection and suppression System with complete details of supplier, function, type and location of area covered by nozzles.
38. Calculation showing sufficiency of capacity of fuel tank in respect of fuel consumption for the offered equipment.

39. To upload authenticated scanned documents chronologically and in tabular form of "General Information, Dimension, Weight and Performance Details" as mentioned in CLAUSE D.9 and all its sub- clauses.

40. To upload an undertaking that the offered equipment shall complies all the safety provision and devices as per the Gazette Notification 2018 as well as DGMS Circular 06 Dated 27.02.2020.

FORMAT FOR PAST SUPPLY

Company / User Mine Name	**Mine Name & its type where the equipment is deployed**	**Complete Address of Company / user mine**	**Contract No. and Date**	**Phone no.* / Mobile No.***	**Fax No*.**	**E-Mail ID***	**Name of contact person**	**Sl. No. of machines**	**Model**	**Commissioning Date**

*Should be recent and active for getting information during tendering process and afterwards.

FORMAT FOR MAJOR DEPOT / WARE HOUSE

Major Depot / Warehouse			**Service Facility**		
Location with complete address	**Contact Nos.**	**Inventory Value (Approx.)**	**Location with complete address**	**Type of facility available**	**No. of Engineers***

***Engineers / Technicians employed to service the equipment either at the facility or on-site.**

Front End Loader 6-7 Cum

PART-D. EQUIPMENT SPECIFICATION OF FRONT END WHEEL LOADER OF BUCKET CAPACITY IN THE RANGE OF 6.0 - 7.0 CuM

D.1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, self-propelled, articulated wheel loader of bucket capacity in the range of 6.0 to 7.0 CuM.

D.2. References

The following International Standards are referred to in, and form part of, the Specification:

ISO 2867: Earth-moving machinery - Access System

ISO3449: Earth-moving machinery - Falling object protective structures-Laboratory tests and performance requirements

ISO3450: Earth-moving machinery - Wheeled machine-Performance requirements and test procedures for braking systems

ISO 3457: Earth-moving machinery - Guards and shields - Definitions and Specifications
ISO3471: Earth-moving machinery - Roll-over protective structures - laboratory tests and performance requirements

ISO5010: Earth-moving machinery - Rubber tyred machines- steering requirements
ISO5998: Earth-moving machinery - Rated operating load for crawler and wheel loaders or superseded ISO, if any.

ISO6014: Earth-moving machinery - Determination of ground speed
ISO6405-1: Earth-moving machinery - Symbols for operator controls and other displays - Part I: Common symbols

ISO6405-2: Earth-moving machinery - Symbols for operator controls and other displays - Part II: Specific symbols for machines equipment and accessories

ISO 6682: Earth-moving machinery - Zones for comfort and reach for controls
ISO 6750: Earth-moving machinery - Operation and maintenance - Format and content of manuals

ISO 7131: Earth-moving machinery - Loaders - Terminology and commercial specifications
ISO 7457: Earth-moving machinery - Measurement of turning dimensions of wheeled machines

ISO 7546: Earth-moving machinery - Loader and front loading excavator buckets-Volumetric ratings

ISO 8313: Earth-moving machinery - Loaders -Methods of measuring tool forces and tipping tools or superseded ISO, if any

ISO 9249: Earth-moving machinery - Engine test code - Net power ISO 10570: Earth-moving machinery - Articulated frame lock- Performance requirements.
ISO 10968: Earth-moving machinery - Operator's Controls.

Any other ISO specifications as may be applicable. The equivalent standards, if any, to any of the above ISO standards if offered are to be supported by documentary evidence in form of copies of equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

D.3. Design Criteria

The loader shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive blasted sand stone/rock having a density after blasting of 1800 kg/cum or in coal having a density after blasting of 1150 kg/ cum.

The loader shall have the following working ranges:

- **a.** Reach at full lift and 45 deg. discharge with teeth:- Equal or more than 1.8 meter
- **b.** Digging depth: - Equal or more than 130 mm
- **c.** Hinge pin height :- Equal or more than 5.0 meter
- **d.** Overall height with ROPS: - Equal or more than 4.1 meter
- **e.** Dump clearance at full lift and 45 degree discharge angle with teeth:- Equal or more than 3.3 meter
- **f.** Operating Weight of Machine with definite boom, arm and bucket combination:- Equal or more than 45,000 Kg

D.4 Technical Requirements

D.4.1. Engine

The loader shall be powered by a direct injection stroke diesel engine of not less than 350 kW net power measured between 1700 and 2100 r/min according to ISO 9249. The engine shall be powered with 24V electric starting, dry type 2-stage air-cleaner with automatic dust evacuator and dust level indicator and 2 stage fuel- filters with water separator.

The engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty radiator. The system shall be capable of providing sufficient cooling to allow the loader to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling. The engine(s) shall be equipped with an over-speed governor.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with environmental emission norm of minimum EPA Tier II or equivalent or above standard certified /compliance. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of submission of tender. Certificate for EPA Tier II or equivalent or above standard certified /compliance from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

D.4.2 Transmission

The loader shall be provided with an off-highway power shift hydraulic transmission. The transmission shall be equipped with electronically shift control with built in protection and self-diagnostic accessibility features. It shall have a minimum of 3 forward & 3 reverse speeds. Suitable protection of the transmission pan from external damage should be provided. The pan guard should be designed to minimize accumulation of dirt and debris.

D.4.3 Drive System

All wheels drive, a dynamically balanced propel shaft with universal joints at both ends should be utilized for transmission of power. Adequate means should be provided to prevent damage to other components in the event of failure of the universal joints.

The final drive shall comprise a heavy duty differential with high quality spiral Bevel Gear and Pinions and a heavy duty planetary gear system and drive axle.

D.4.4 Steering

Full hydraulic load sensing steering system with joy stick control and emergency steering which complies with ISO 5010 standard shall be provided. Emergency steering shall be automatically activated in the event of failure of the normal steering power sources.

D.4.5 Hydraulic System

A suitable capacity completely sealed/ enclosed hydraulic system with low effort electrohydraulic pilot operated control system shall be provided for all operating functions of Bucket controls of the loader. There should be provision of return line filter in Hydraulic System to enhance the life of Hydraulic component due to impurity of Hydraulic oil.

D.4.6 Hoses

All hoses shall be heat resistant / heat retardant and grouped as far as possible and suitably clipped to lessen damage from scuffing.

D.4.7 Brakes

Suitable reliable fail safe service, secondary and parking brakes which comply with ISO 3450 shall be provided.

D.4.7.1 Service Brakes

The front and rear i.e. four wheel service brakes shall be hydraulic oil actuated, oil cooled and multiple disc type. They should be fully enclosed to prevent entry of dust/ dirt & water and designed for low maintenance and should have modulated engagement with adjuster arrangement. It should operate parking brake automatically in the event of low oil pressure/ pressure drop and have fully modulated.

D.4.7.2 Parking Brakes

The parking brake shall be fully enclosed, spring applied oil released dry disc / wet disc type mounted on transmission transfer gear output shaft. The electronic monitoring system should alert operator if transmission is engaged while parking brake is applied.

D.4.8 Tyres

Equipment shall be provided with Tubeless, rock duty, cut-resistant, L-4 type of suitable size radial tyres.

Automatic Tyre Pressure Monitoring System with suitable audio or visual or both alarms in case of pressure drop beyond a certain limit is to be provided on the dashboard.

D.4.9 Operating Load (Rated Load)

The maximum operating load of wheel loader should not exceed 50 % of static tipping load with the loader in full turn position as per SAE standard.

D.4.10 Bucket lifting mechanism

The main lift arm and linkage should be sturdily designed & built, properly supported and adequately lubricated to ensure faster loading and unloading of the bucket with reduced strain on hydraulic system.

The loader should be provided with automatic bucket positioner and automatic lift kick out.

D.4.11 Bucket

The loader shall be fitted with a hard faced heavy duty rock bucket with spade nose edge of capacity in the range of 6.0 to 7.0 CuM rated according to ISO: 7546 with spill board attachment and easily replaceable ground engaging tools (i.e. tooth adopter, tooth point, accessories etc.)

D.4.12 Fuel Tank

The fuel tank shall be of sufficient capacity for 16 hours operation without refueling, and be provided with a level indicator and a lockable hinged filler cap. Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

Calculation of sufficiency of fuel tank needs to be submitted.

D.4.13 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

D.4.13.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

D.4.13.2 Operator's Protective Structures:

Loader shall be equipped with FOPS as per ISO –ISO3449 & ROPS as per ISO 3471/ ISO 12117-2

D.4.13.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

D.4.13.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

D.4.13.5 Starting and Stopping System:

Loader shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

All operator control i.e. Gear selection, steering operation & bucket operation should be joystick / finger-tip controlled. In case of abnormal leakage of Engine oil/ Transmission oil in equipment, there shall be provision to lower the gear selection up-to first gear in operating condition or suitable mechanism to alert the operator to stop the equipment in safe place

D.4.14 Gauges & Indicators

The following shall be provided as a minimum:

a. Engine coolant temperature gauge / indicator.
b. Engine oil pressure gauge / indicator
c. Power train / transmission/ Converter oil temperature gauge / indicator
d. Fuel capacity gauge
e. Engine tachometer/speedometer
f. Ground speed and gear indicator
g. Engine hour-meter
h. Operating parameter & diagnostic code display including low level of Engine oil & Transmission oil
i. Air pressure gauge (if applicable)

In case any of these gauge(s) is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

D.4.15 Machinery House

The Loader shall be provided with a dust proof machinery house/suitable arrangement made of steel sheet supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.
In case non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator's cab and service platforms that shall comply with International Standards.

D.4.16 Warning Alarms/ Lights / Buzzer

The following audio/visual warning alarms shall be provided:.

a. Engine oil pressure
b. High Torque convertor oil temperature
c. Low Engine Oil Pressure
d. High Coolant Temperature
e. Emergency Steering
f. Coolant level
g. Brake Indicator light
h. Audio-Visual Reversing Alarm- To confirm its make and compliance of the Design, Specification, marking and conformity to the prescribed standards indicated in the letter no. DGMS (Approval)/AVA/01 Dt.25.05.2010 (refer DGMS website www.dgmsindia.in) of DGMS, Dhanbad. Bidder shall confirm acceptance of stipulations in respect of inspection and maintenance of this letter.

D.4.17 Electrical Equipment: The Loader shall be provided with the following-

a. 24V DC electrical system with suitable rated alternator of reputed make
b. Reputed make suitable capacity electric starting motor.
c. High capacity Maintenance Free (Zero Maintenance i.e. completely sealed and no top up required during the course of battery life) batteries of reputed make.

The bidder have option to fit batteries of indigenous make also. It is essential to indicate

make of batteries in bought out item list.

d. Battery isolation switch

All electrical circuits shall be protected by adequately rated fuses or circuit breakers which shall be easily accessible for maintenance. In case of fuses, at least two spare fuses of each size/ratings shall be provided in each fuse box, which shall be easily accessible for maintenance. A ground level battery disconnect switch shall be provided. All electrical connectors shall be sealed to suppress entry of dust and moisture.

D.4.18 Lighting

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following as minimum:

a. 4 nos. front and 02 nos. rear headlights
b. Stop and tail lights LED type
c. 4 nos. ROPS mounted working lights (2-front and 2-rear)
d. Instrument panel & Cabin dome light
e. Fog lights
f. Manual / Auto backup light

Headlights and rear working lights shall be identical in type and size and fitted in steel protective enclosures.
Wattage, Number and other details of lights provided shall be furnished.

D.4.19 Guards and Shields

Adequate guards and shields which comply with ISO 3457 shall be provided throughout the loader.

D.4.20 Fire Extinguisher

An adequate number of fire extinguishers shall be provided at all strategic points on the equipment, suitably mounted in heavy duty brackets for ease of removal. The extinguishers shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683.
All material used in the fire-fighting systems shall be non-toxic and in no manner harmful to human beings during handling and use.

The high pressure storage vessels and hoses, if used with fire- fighting systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Materials and Chemicals to be used in fire extinguisher duly tested from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013.

D.4.21 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed lubrication points on the machine, except where use of high viscosity lubricants prevent the application of pumped systems.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of lubrication system shall be repeated on the instrument/ test panel (specified elsewhere). Lubricant containers shall be located inside the machinery house and be large enough to cater for a minimum of 100 (one hundred) hours continuous operation. The containers shall be fitted with suitable cleaning arrangement. All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection. The lubrication lines to the boom point should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced. Lubricants used shall be preferably of reputed Indian make.

D.4.22 AUTO FIRE DETECTION AND SUPPRESSION SYSTEM

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Loader.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick clean-up and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator’s cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

D.23 Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

a) Working hour
b) Engine oil pressure & temperature
c) Coolant temperature
d) Coolant flow
e) Coolant level
f) Engine RPM
g) Fuel level and fuel consumption rate
h) Transmission Oil temperature
i) Hyd. oil temperature
j) Hyd. Oil Level in the tank
k) Engine electrical system - Battery voltage and Alternator out put

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
1. The real time interface telemetry port will be provided in the equipment
2. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
3. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
4. There shall be integrated on board data management system as explained at point no.3 as above.

5. Permission to third party for interfacing, data collection through online port.
6. Signing of Non-disclosure agreement to protect intellectual property right on either side.
7. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
8. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

   This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

   To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

D.24 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment

The following safety features shall be provided in the equipment

a. All function cut off switch
b. Roll over protection.
c. Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
d. Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
e. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
f. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
g. Mirrors, right and left
h. Hot zones shall be separated from cold zone by providing baffle plate.
i. Exhaust pipes and turbocharger shall be adequately guarded.
j. Vent valve on top of Hydraulic Tank should be able to be removed without any tool.
k. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot in and around loader
l. Suitable auto dipping system.
m. Suitable protection guard / device for windscreen / windshield of Operator's cabin.
n. Retro Reflective Reflectors on all sides for visibility of loader during night

o. Manual wheel stopper while parking loader in gradient
p. Bucket lifting position locking arrangement
q. Provision of two brakes. One of the brake should be fail safe

D.25 Ancillary Equipment and Other Requirements:

The following shall be provided on the loader:

a. Draw bar with pin
b. Fan guard
c. Fenders
d. Hood sides.
e. Double horn
f. Vandalism protection kit
g. Suitable device as Equipment Health Monitoring System for better reliability.
h. Suitable device to reduce wheel spin and traction in poor ground condition.
i. Tyre inflation kit

D.5 Performance Guarantee: In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 5000 (five thousand) hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for balance period of the contract.

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

D.6 Special Guarantees

The following special assemblies and sub-assemblies must perform / achieve the minimum performance level as detailed below from the date of commissioning of equipment. :

a. **Body, Chassis and differential:** 10000 hours or 1000 calendar days whichever is earlier from the date of commissioning
b. **Complete engine system:** 24 months or 7500 hours whichever is earlier from the date of commissioning
c. **Transmission Assembly:** 24 months or 7500 hours whichever is earlier from the date of commissioning.
d. **Engine Hour Meter, Gauges, Indicators, Sensors:** 12 months or 3000 hours whichever is earlier from the date of commissioning
e. **Electrical items:** 12 months or 3000 hours whichever is earlier from the date of commissioning
f. **Tyre -**5000 hours of operation for each tyre from date of fitment.

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission

pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item.

In any case liability of manufacturer / supplier shall be limited for entire contract period from the accepted date of commissioning.

D.7 Expected life of major assemblies:

Bidder is to upload authenticated scanned document of the expected life (In terms of working hours) of the following major assemblies / sub-assemblies.

1) Engine
2) Transmission
3) Differential
4) Hydraulic
5) Pumps
6) Hydraulic cylinders
7) Tyres

Note - Expected life means life before first overhaul

D.8 Equipment Acceptance

The equipment ordered will be finally accepted subject to the bidder demonstrating to the purchaser or its authorized representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random) by the purchaser when tested as indicated below, meets the performance data provided by the supplier in accordance with requirements of the clause of the NIT. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturers Certified test copy for that parameter of performance data provided by the supplier in accordance with requirements of clause of NIT. A detrimental deviation of up to 2½% will be accepted.

1 Specific fuel consumption readings at full load: Minimum of 3 (three) to be averaged Manufacturers Test Data / Report should be submitted.

2 Pay load Capacity: To be tested at Works or Site(s)

3 Engine Net Power & RPM: Equipment Manufacturer Test Data / Report should be submitted.

4 Driving Speed - as per ISO 6014: To be tested at works or Test Report/Test Certificate certified by Equipment Manufacturer should be provided

5 Service Brakes stopping distance as per ISO 3450: To be tested at works or Test Report/Test Certificate certified by Equipment Manufacturer should be provided

6 Secondary Brakes stopping distance as per ISO 3450: To be tested at works or Test Report/Test Certificate certified by Equipment Manufacturer should be provided

7 Turning Dimensions as per ISO 7457: To be tested at Works or Test Report/Test Certificate

certified by Equipment Manufacturer should be provided

D.9 Information to be provided by the supplier:

The supplier shall furnish the following information.

D.9. Dimensions, Weights and Performance Details - The bidder has to submit the values / details against following clause for offered equipment

D.9.1	**Dimensions**
	f. Maximum Overall length in m
	g. Maximum width over tyres in m
	h. Maximum overall height - bucket at full raised in m
	i. Bucket width in m
	j. Clearance diameter - bucket at carry in m
D.9.2	**Working Ranges:**
	c. Dump clearance at maximum lift and 45 degree discharge in m
	d. Reach at maximum lift and 45 degree discharge in m
D.9.3	**Machine Weights**
	e. Bucket weight in Kg
	f. Operating Weight - Front wheels in Kg
	g. Operating Weight - Rear wheels in Kg
	h. Total Operating Weight in Kg
D.9.4	**Engine**
	ee. Manufacturer and model
	ff. Number of cylinders
	gg. Bore (in mm)
	hh. Stroke (in mm)
	ii. Displacement (in Liter)
	jj. net power (max^m) at..... r / min as per ISO 9249
	kk. Maximum torque at .....r / min as per ISO 9249
	ll. ECM make, version and features
	mm. Model year
	nn. Specific Fuel Consumption (SFC) as per Engine Performance Curve complying with ISO:9249 (gm/ kw-hr)
D.9.5	**Transmission**
	f. Make and model
	g. Type
	h. Number of gear speeds: forward and reverse
	i. Travel speeds:(forward gears) in Km/h
	j. Travel speeds (reverse gears) in Km/h

D.9.6	**Final Drive** :
	f. Type & Make
	g. Differential ratio
	h. Planetary ratio
	i. Rear axle oscillation
	j. Wheel lift - total in mm
D.9.7	**Steering**
	e. Make & Type
	f. Minimum turning radius (over tyres) in mm
	g. Emergency steer method
	h. Steering angle (each direction)
D.9.8	**Electrical System**
	p. Starter make , model and rating
	q. Starter control make and model
	r. Alternator make , model and rating
	s. Batteries numbers , Make and rating (Ah & CCA)
	t. Lighting details
D.9.9	**Brakes**
	a. Service Brake : Make, Model
	b. Service Brake : Front: Type
	c. Service Brake : Front: Actuating System
	d. Service Brake : Rear : Type
	e. Service Brake : Rear : Actuating System
	f. Secondary Brakes: Type
	g. Secondary Brakes: Actuating System
	h. Parking brakes : Type
	i. Parking brakes: Actuating System
D.9.10	**Tyres**
	a. Make
	b. Size
	c. Type
	d. Tread depth

	e. Ply /Star rating
	f. Rim Size
D.9.11	**Hydraulic System**
	a. Make & Model of Pumps
	b. Type of Pumps
	c. Number of Pumps
	d. Flow rate of Pumps
	e. Operating pressures of Pumps
	f. Make & Model of Cylinders
	g. Number of Cylinders
	h. Piston Diameters of Cylinders
	i. Stroke Length of Cylinders
	j. Relief valve setting pressures (kPa)
	k. Operating pressures of all systems (kPa)
	l. Hydraulic Cycle Time • Raise lift Arm (Loaded)
	m. Hydraulic Cycle Time • Dump bucket (Loaded)
	n. Hydraulic Cycle Time • Lower lift arm (empty)
	o. Hydraulic Cycle Time •Total cycle time
D.9.12	**General**
	a. Details, number and location of fire extinguishers
	b. Make, Model and Operating range of all gauges/ indicators
	c. Make, Model of all warning alarms

1.	List of tools covered in Comprehensive tool kit along with quantity required for general Maintenance and repair.
2	List of Special Tools if required for erection and commissioning of Equipment.
3	A Self certificate to the effect that any other tool if required over and above the list of comprehensive tool kit and special tool, shall be provided by the bidder at no cost to purchaser during the contract period.
4	A self-certificate to the effect that the offered equipment will work and perform satisfactorily in the Geographical and climatic conditions as mentioned in CLAUSE No. C.1.
5	Details of major bought-out items including Air-Conditioner etc indicating manufacturer name with their complete address.
6	Self-Certificate with respect to all major components other than items identified / mentioned in Major bought out items list are manufactured by the bidder in their works exclusively as per CLAUSE No. C.6.1.b.
7	List of Spare parts & Consumables including refrigerant, coolant, lubricants & Greases (per equipment wise), required for operation of Loader during warranty period.
8	List of Spare Parts and Consumables including refrigerant, coolant and lubricant for balance 3 years period beyond the warranty period of the equipment per year per equipment wise.
9	Schedule of use of all necessary lubricants, coolant greases etc. for the operation and maintenance of the equipment, estimated annual consumption and appropriate international standard / brand name or the brand name and reference number of equivalents available in India as per CLAUSE No. C.6.5 of TPS.
10	Details of Schedule of Maintenance indicating time required for accomplishing each of the maintenance task.
11	Quality Assurance Plan for various stages of manufacture.
12	Copy of valid certificate, valid as on date of opening of tender substantiating compliance with an internationally recognized Quality Assurance Standard.
14	To upload an undertaking to maintain after sales service throughout the life of equipment.
15	Detailed Scope of Specification for Front End Wheel Loader having bucket capacity in the range of 6.1 to 7.0 Cum.
16	Detailed description of Engine provided with offered F E Wheeled Loader.
17	Self- Certificate w.r.t environmental/emission norms of Tire II or equivalent or higher.
18	Calculation showing Sufficiency of capacity of Fuel Tank in respect of fuel consumption.
19	Details with location of Gauges & Indicators.

20	Details with location of Warning Alarms/Lights.
21	Lighting details showing quantity, wattage and other details of lights provided in offered model of equipment.
22	Fire Extinguisher: Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Material and Chemical used in fire extinguisher duly tested from
	any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
23	AUTO FIRE DETECTION AND SUPPRESSION SYSTEM**:** Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along-with other documents, for Material and Chemical used in fire suppression system duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
24	In respect of Audio Visual Reversing Alarm -The bidder will submit an undertaking for Compliance of Design, Specification, marking and conformity to the prescribed standards indicated in the letter no. DGMS (Approval)/AVA/01 Dt.25.05.2010 of DGMS, Dhanbad. And also confirm acceptance of stipulations in respect of inspection and maintenance of this letter.
25	Detailed description of Equipment Health Monitoring System with Data Logging Units provided with offered Loader.
26	Details of device fitted to reduce wheel spin and traction in poor ground condition.
27	Bidder is to upload authenticated scanned document of expected life in terms of working hours of the major assemblies.
28	List of number of offered model of equipment supplied in past in the format given in technical specification.
29	Details of nearest Depot / warehouse and service facilities given in the format given in technical specification.
30	Details of erection program for the bid.
31	Struck and Heaped Volumetric rating of the bucket according to ISO 7546 together with verification calculations and drawings.
32	Rated operating load according to ISO 5998.
33	Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO: 9249. Engine Performance curve must indicate model of the offered Loader & engine.
34	Maximum travel speed determined according to ISO 6014.

35	Result of service and secondary brake stopping tests carried out according to ISO 3450 in the format given in technical specification.
36	Turning diameter as defined in ISO 7457.
37	Detailed technical descriptions and specifications of each system of the offered FE Wheel Loader.
38	Layout drawings and detailed technical descriptions of all hydraulic systems and components.
39	Comprehensive commercial literature indicating therein complete technical specifications of the offered model of equipment, the content of which must comply with ISO 7131.
40	Detailed list of instrumentation, monitoring and alarm systems.
41	Detailed technical description of Electronic Control Module used, Diagnostic Tools features, and Equipment Health Monitoring System.
42	Bidder is to upload authenticated scanned documents of Schematic and layout drawings with details of the Supplier, number, function and type of Automatic fire detection and suppression System.
43	Detailed description with Schematic drawings of Automatic Lubrication System indicating the details of the supplier, number, type and its function.
44	Scanned documents showing Maximum breakout force, lifting capacity and static tipping load in full turn position measured according to ISO 8313.
45	To upload authenticated scanned documents chronologically and in tabular form of " General Information, Dimension, Weight and Performance Details" as mentioned in TECH CLAUSE C.11.3 and all its sub-clauses (C.11.3.1 to C.11.3.12)
46	Lighting details showing quantity, wattage and other details of lights provided in offered model of equipment.
47	To upload an undertaking that the offered equipment shall complies all the safety provision and devices as per the Gazette Notification 2018 as well as DGMS Circular 06 Dated 27.02.2020.

PAST SUPPLY FORMAT

Company / User Mine Name	Mine Name & its type where the equipment is deployed	Complete Address of Company / user mine	Contract No. and Date	Phone no.* / Mobile No.*	Fax No*.	E-Mail ID*	Name of contact person	Sl. No. of machines	Model	Commissioning Date

*Should be recent and active for getting information during tendering process and afterwards.

MAJOR DEPOT / WAREHOUSE FORMAT

Major Depot / Warehouse			Service Facility		
Location with complete address	**Contact Nos.**	**Inventory Value (Approx.)**	**Location with complete address**	**Type of facility available**	**No. of Engineers***

***Engineers / Technicians employed to service the equipment either at the facility**

or on-site. FORMAT OF Result of service and secondary brake stopping test:

Braking system tested	Slope (%)	Machine speed(Km/h)	Stopping distance(m)
Service Brake			
Secondary Brake			

TRAINING NEED

Type of Personnel	At Site	
Minimum No. of Personals on Each Project site	**Period (For each Personal)**	
Engineer	02	02 weeks
Supervisor	04	02 weeks
Fitter/Electrician	06	02 weeks
Operator	Minimum 03 Nos	02 weeks

Bull Dozer

410 HP CRAWLER MOUNTED DOZER
[Engine Net Power Range 400 HP – 420 HP]

PART D: - EQUIPMENT SPECIFICATIONS

1. Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-propelled, crawler mounted 410HP dozer [**Engine Net Power Range 400 HP – 420HP** (298.28 KW- 313.19 KW)]

2. References:

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867:	Earth-moving machinery - Access System
ISO 3449:	Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements.
ISO 3457:	Earth-moving machinery - Guards and shields - Definitions and Specifications
ISO3471:	Earth-moving machinery - Roll-over protective structures - laboratory tests and performance requirements
ISO6014:	Earth-moving machinery - Determination of ground speed
ISO6405-1:	Earth-moving machinery - Symbols for operator controls and other displays - Part I: Common symbols
ISO6405-2:	Earth-moving machinery - Symbols for operator controls and other displays - Part II: Specific symbols for machines equipment and accessories
ISO 6747:	Earth-moving machinery - Tractors - Terminology and commercial specifications
ISO 6750:	Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7095:	Earth-moving machinery - Crawler tractors and crawler loaders - Operator's controls

ISO 7129:	Earth-moving machinery - Tractors with dozer, grader, tractor scrapers - Cutting edges - Principal shapes and basic dimensions
ISO7464:	Earth-moving machinery - Method of test for the measurement of drawbar pull
ISO 9246:	Earth-moving machinery - Crawler and wheel tractor dozer blades - Volumetric ratings
ISO 9249:	Earth-moving machinery - Engine test code - Net power
ISO 10265	Earth moving machinery - Crawler machines - performance requirements and test procedures for braking systems.
ISO 10968	Earth moving machinery - Operator's controls
ISO 5006	Earth-moving machinery -- Operator's field of view -- Test method and performance criteria.

3. Design Criteria:

The dozer shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive blasted sandstone/ rock having average density after blasting of 1800kg/m3.
The dozer shall have the following minimum range of drawbar pull, measured according to ISO 7464:

a) 160 kN to 430 kN at 1 km/h speed
b) 200 kN to 640 kN at zero speed.

4. Technical Requirements:

4.1 Engine:

The dozer shall be powered by a direct injection 4 -stroke turbo charged diesel engine of net power ranging from **400 HP to 420HP** (298.28 KW- 313.19 KW) measured between **1700 and 2200 rpm** according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy- duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier 1 or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for EPA Tier 1 or above or equivalent from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet up to 3 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.
Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 Drive System:

Power transmission from the engine to the crawler drive sprocket should either be through conventional means i.e., torque flow transmission, differential, final drive, steering and brakes or through any other proven means. A dynamically balance propel shaft with universal joints at both ends should be utilized for transmission of power. Adequate means should be provided to prevent damage to other components in the event of failure of universal joints.

Conventional Drive System: In the case of a conventional system, the following shall be provided:

4.3 Transmission:

Torque-flow transmission consisting of single stage torque converter, planetary gear drives and hydraulically operated multiple disc type clutches equipped with suitable valves for developing a minimum of 3 forward speed and 3 reverse speed.

Heavy-duty removable belly guard, designed such that it does not allow accumulation of dirt.

4.4 Differential (Where Applicable)***:***

Heavy-duty differential with high quality spiral bevel gear and pinions.

4.5 Final Drive:

Heavy-duty spur and / or planetary gear system from differential to drive axle.

4.6 Steering:

Independent track steering by means of hydraulically actuated oil cooled multiple disc steering clutches and brakes shall be provided. These are to be held in engagement by springs and disengaged hydraulically.

4.7 Hoses:

Fire resistant/ fire retarder/ heat resistant hydraulic hoses in place of ordinary hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.8 Alternative Drive System:

In the case of any other alternative type of drive, the system must be clearly defined and illustrated. The advantages and disadvantages compared with a conventional system must be adequately described to allow proper evaluation.

4.9 Undercarriage:

The undercarriage shall be heavy duty rugged designed suitably, suspended with oscillating type equalizer bar and pivot shaft to reduce shock loads transmitted to the dozer. Track frames and load rollers shall be of sufficient strength to withstand the high loads, which may occur due to uneven ground conditions. They shall be of welded construction and stress relived as required. The sprocket should preferable be a segmented bolt-on type. Lifetime lubricated idler and rollers, and a reliable track tensioning arrangement should be provided. Extreme service single grouser shoes of not less than 610 mm width shall also be provided.

4.10 Dozer Attachment:

The Dozer shall be fitted with hydraulically controlled Semi –U tilt / Straight Tilt dozer attachment. The dozer blade shall be heavy-duty type with steel wear plates and heavy- duty end bits. Heavy duty hardened steel wear resistant cutting edges, which comply with ISO 7129 shall be provided.

4.11 Fuel tank:

The fuel tank shall be of sufficient capacity for 16 hours operation without refuelling, and be provided with a level indicator and a lockable-hinged cap.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Operator's Station:

A suitable Operator’s Station shall be provided on the equipment as per Gazette

notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.12.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.
Non-slip type steps, walkways and handrails, which comply with ISO 2867, shall be provided for access to the operator's cabin. All directional movements, forward travel, reverse travel, gear selection, steering operation should be joystick / finger-tip / suitable lever (to be decided by subsidiary company) controlled. Joystick shall be provided for blade operation.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.12.2 Operator's Protective Structures:

Dozer shall be equipped with FOPS as per ISO –ISO3449 & ROPS as per ISO 3471/ ISO 12117-2

4.12.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.
Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.12.4 Operator's Controls and Indicators:
The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

In case of abnormal leakage of Engine oil/ Transmission oil in equipment, there shall be suitable mechanism to lower reduce rpm or provision of proper indication to alert the operator to stop the equipment in safe place.

4.12.5 Starting and Stopping System:

Dozer shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.
The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.13 Gauges and indicators/ Electronic Display*:*

The following shall be provided:

a) Water / coolant temperature gauge
b) Engine oil pressure gauge/ indicator
c) Transmission Oil Pressure Gauge
d) Fuel capacity gauge.
e) Engine tachometer
f) Engine hour-meter
g) Operating parameter & diagnostic code display

In case any of these gauge(s) is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.14 Warning Alarms / Lights/Indicator:

The following warning alarms shall be provided:

a) Coolant level and temperature
b) Engine oil pressure
c) Converter oil temperature (where applicable)
d) Front warning horn
e) Reversing –DGMS complied Audio Visual Alarm.

4.15 Electrical Equipment:

The dozer shall be provided with the following:

a. 24V DC electrical system with suitable rated alternator of reputed make
b. 24 V Electrical starter motor of reputed make
c. High-capacity maintenance free batteries of reputed make.
d. Battery isolation switch / Relay

All Electrical wires & sleeves are to be of fire resistant quality to decrease chance of fire.
Electrical wires are to be passed through flexible metallic conduit to avoid damage of insulation of the wire due to friction that may cause short circuit.
All electrical circuits shall be protected by adequately rated fuses/ circuit breakers.

4.16 Lighting:

Adequate lighting shall be provided for safe nightshift operation. All lighting system shall be of LED type.

The lighting system should include the following:

a. 4 nos. headlights
b. 2 nos. rear working lights
c. 4 nos. ROPS mounted working lights (2-front and 2-rear)
d. Cabin dome light

Headlights and rear working lights shall be identical in type and size and fitted in steel protective enclosures.

4.17 Guards and shields*:*

Adequate guards and shields, which comply with ISO 3457, shall be provided throughout the dozer.

4.18 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed lubrication points on the machine, except where use of high viscosity lubricants prevents the application of pumped systems.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts. The monitoring system shall, wherever

necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of lubrication system shall be repeated on the instrument/ test panel (specified elsewhere).

Lubricant containers shall be located inside the machinery house / at suitable safe location and be large enough to cater for a minimum of 50 (fifty) hours continuous operation. The containers shall be fitted with suitable cleaning arrangement.

All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced.

Lubricants used shall be preferably of reputed Indian make.

4.19 Fire Detection and Suppression System:

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.20 Fire Extinguisher:

A fire extinguisher shall be provided on the dozer, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS:15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Fire Extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) CircularNo.02 dtd. 08thJuly2013.

Periodical refilling of fire extinguisher to be done by the supplier within the contract period.

4.21 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment
The following safety features shall be provided in the equipment

a. All function cut off switch
b. Roll over protection.
c. Turbocharger guard.
d. Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
e. Mirrors, right and left
f. Hot zones shall be separated from cold zone by providing baffle plate
g. Exhaust pipes and turbocharger shall be adequately guarded.

h. Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot in and around dozer.
i. Retro Reflective Reflectors on all sides for visibility of dozer during night.
j. Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
k. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
l. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

5 Ancillary equipment and other requirements

a) Front pull hook
b) Rear mounted rigid draw bar

6 Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

I. Working hour based on the duration of a shift for which the equipment is switched on for operation
II. Engine oil pressure & temperature
III. Coolant temperature
IV. Coolant level
V. Engine RPM
VI. Fuel level and fuel consumption rate
VII. Hyd. oil temperature
VIII. Hyd. Oil Level in the tank
IX. Engine electrical system - Battery voltage and Alternator out put
X. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Dozer Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

I. There has to be one integrated single online port for capturing all the vital data.
II. The real time interface telemetry port will be provided in the equipment
III. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
IV. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
V. There shall be integrated on board data management system as explained at

point no.3 as above.

VI. Permission to third party for interfacing, data collection through online port.

VII. Signing of Non-disclosure agreement to protect intellectual property right on either side.

VIII. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.

IX. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

7 Special Guarantees

The following guarantee will apply for the different components from the date of commissioning:

i) Main Frame –10,000 hours
ii) Complete engine system –6000 hours
iii) Transmission Assy. –6000 hrs
iv) Final Drive (excluding Sprocket) and Steering System –6000 hrs
v) Engine Hour Meter - 3000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser.

8 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are **4000 (Four thousand)** hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 80% (Eighty percent) annually for a period of 36 months from the date of accepted date of commissioning and 75% (seventy five percent) annually for following years of the contract period.

[[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

9 Expected life of major assemblies:

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
Dozers	Main Frame	
	Engine	
	Transmission/Torque Convertor	
	Electrical system	
	Final Drive (excluding sprocket) & steering system	
	Under Carriage – Track chain, Roller, Idlers & sprocket Teeth	

Note - * Expected life means life before first overhaul

10 Information to be provided by the supplier:

The supplier shall furnish the following information.

10.1 General:

i. Number of similar models supplied during the last **5 (Five)** years. The information shall be given in the following format and in the order of most recent first.

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

ii. Details of special tools to be provided with the equipment.

iii. Details of erection programmes for the bid.

10.2 Technical Details:

i) Detailed technical descriptions and specifications of the dozer.
ii) Layout drawings and detailed descriptions of all machinery including method of power transmission, mounting details and method of alignment.
iii) Latest engine performance curves showing net power, net torque and specified fuel consumption of the installed engine, measured according to ISO 9249.
iv) Maximum travel speed determined according to ISO 6014
v) Calculation of volumetric rating of dozer blade in accordance with ISO 9246.
vi) Dozing Production Curves, showing the following. a.Production with offered blade at 30m distance. b.Production with offered blade at 60m distance.
vii) Comprehensive commercial literature specifications, the content of which must comply with ISO 6747
viii) Details of major bought-out assemblies and sub-assemblies including manufacturer's name with address, type, model etc.
ix) Detailed list of instrumentation monitoring and alarm systems.
x) Operation and maintenance manual.
xi) Schematic and layout drawings and details of the Supplier, number, function and type of Automatic fire detection and suppression System.

10.3 Dimensions, Weight and Performance Details:

10.3.1 Dimensions:

a) Maximum overall length with and without blade (m)
b) Maximum overall width, with and without blade (m)
c) Maximum overall height (m)
d) Drawbar height (m)

10.3.2 Machine weights:

a) Shipping weights of individual components (kg)
b) Total Operating weight (Kg)
c) Operating weight excluding dozer attachment (kg)

10.3.3 Engine:

a) Manufacturer and Model
b) Number of cylinders
c) Bore (mm)
d) Stroke (mm)
e) Displacement (litre)
f) Net power at .....rpm (kw)
g) Maximum Torque (nm)

10.3.4 Transmission:

a) Make and Model
b) Number of gear speeds, forward and reverse
c) Travel speeds, forward and reverse (Km/h)

10.3.5 Differential:

a) Make and Model
b) Type
c) Ratio

10.3.6 Final Drive:

a) Type
b) Ratio

10.3.7 Steering and braking:

a) Type
b) Actuating System

10.3.8 Undercarriage:

a) Undercarriage overall width (m)
b) Crawler track height (m)
c) Crawler effective length (m)
d) Crawler width (m)
e) Crawler shoes, total number
f) Ground contact area (sq.)
g) Ground bearing pressure (kpa)
h) Load rollers, diameter and number per crawler (m)
i) Driving Sprocket diameter (m)
j) Idler roller diameter (m)
k) Centre to centre of idler roller and sprocket, if applicable (m)

10.3.9 Hydraulic System:

a) Make, Model, Number, flow rates and operating pressures of pumps
b) Make, model, number and ratings of motors (where applicable)
c) Make, model, number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures (kpa)
e) Oil quantity in system and tank (ltrs)
f) Filtration system type

10.3.10 Dozer attachment:

a) Maximum digging depth (m)
b) Ground clearance at full lift (m)
c) Maximum tilt adjustment (m)
d) Maximum pitch adjustment (m)

10.3.11 Electrical System

a) Starter: make and model
b) Alternator: make and model
c) Batteries: numbers, voltage and no. of plates/AH rating
d) Lighting details

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 10. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause 10. A detrimental deviation of up to 2½% will be accepted

1	Specific Fuel Consumption as per ISO 9249	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Engine Net Power & RPM	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
3	Drawbar Pull at 1 km/h	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.
4	Production with offered blade at 30 m distance	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.
5	Production with offered blade at 60 m distance	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.

320 HP CRAWLER MOUNTED DOZER

[Engine Net Power Range 310 HP – 330 HP]

PART D: - EQUIPMENT SPECIFICATIONS

Equipment Specification of a Crawler Mounted 320HP Dozer (Engine Net Power Range 310 HP – 330 HP)

1. **Scope of Specification:**

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-propelled, crawler mounted 320HP dozer [**Engine Net Power Range 310 HP – 330HP** (231.17 KW- 246.08 KW)]

2. References:

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867:	Earth-moving machinery - Access System
ISO 3449:	Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements.
ISO 3457:	Earth-moving machinery - Guards and shields - Definitions and Specifications
ISO3471:	Earth-moving machinery - Roll-over protective structures - laboratory tests and performance requirements
ISO6014:	Earth-moving machinery - Determination of ground speed
ISO6405-1:	Earth-moving machinery - Symbols for operator controls and other displays - Part I: Common symbols
ISO6405-2:	Earth-moving machinery - Symbols for operator controls and other displays - Part II: Specific symbols for machines equipment and accessories
ISO 6747:	Earth-moving machinery - Tractors - Terminology and commercial specifications
ISO 6750:	Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7095:	Earth-moving machinery - Crawler tractors and crawler loaders - Operator's controls
ISO 7129:	Earth-moving machinery - Tractors with dozer, grader, tractor scrapers - Cutting edges - Principal shapes and basic dimensions
ISO7464:	Earth-moving machinery - Method of test for the measurement of drawbar pull
ISO 9246:	Earth-moving machinery - Crawler and wheel tractor dozer blades - Volumetric ratings
ISO 9249:	Earth-moving machinery - Engine test code - Net power

ISO 10265	Earth moving machinery - Crawler machines - performance requirements and test procedures for braking systems
ISO 10968	Earth moving machinery - Operator's controls
ISO 5006	Earth-moving machinery -- Operator's field of view -- Test method and performance criteria.

3. Design Criteria:

The dozer shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive blasted sandstone/ rock having average density after blasting of 1800kg/m3.
The dozer shall have the following minimum range of drawbar pull, measured according to ISO 7464:

a) 160 KN to 380 KN at 1 km/h speed
b) 180 KN to 550 KN at zero speed

4. Technical Requirements:

4.1 Engine:

The dozer shall be powered by a direct injection 4 -stroke turbo charged diesel engine of net power ranging from 310 HP- 330 HP (231.17 KW- 246.08 KW) measured between **1700 and 2200 rpm** according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy- duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance &reduced emissions level. All engine vital

parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier 1 or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for EPA Tier 1 or above or equivalent from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet up to 3 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 Drive System:

Power transmission from the engine to the crawler drive sprocket should either be through conventional means i.e., torque flow transmission, differential, final drive, steering and brakes or through any other proven means. A dynamically balance propel shaft with universal joints at both ends should be utilized for transmission of power. Adequate means should be provided to prevent damage to other components in the event of failure of universal joints.

Conventional Drive System: In the case of a conventional system, the following shall be provided:

4.3 Transmission:

Torque-flow transmission consisting of single stage torque converter, planetary gear drives and hydraulically operated multiple disc type clutches equipped with suitable valves for developing a minimum of 3 forward speed and 3 reverse speed.

Heavy-duty removable belly guard, designed such that it does not allow accumulation of dirt.

4.4 Differential (Where Applicable)***:***

Heavy-duty differential with high quality spiral bevel gear and pinions.

4.5 Final Drive:

Heavy-duty spur and / or planetary gear system from differential to drive axle.

4.6 Steering:

Independent track steering by means of hydraulically actuated oil cooled multiple disc steering clutches shall be provided. These are to be held in engagement by springs and disengaged hydraulically.

4.7 Hoses:

Fire resistant/ fire retarder/ heat resistant hydraulic hoses to decrease the chance of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant /fire retarder type.

4.8 Alternative Drive System:

In the case of any other alternative type of drive, the system must be clearly defined and illustrated. The advantages and disadvantages compared with a conventional system must be adequately described to allow proper evaluation.

4.9 Undercarriage:

The undercarriage shall be heavy duty rugged designed suitably, suspended with oscillating type equalizer bar and pivot shaft to reduce shock loads transmitted to the dozer. Track frames and load rollers shall be of sufficient strength to withstand the high loads, which may occur due to uneven ground conditions. They shall be of welded construction and stress relived as required. The sprocket should preferable be a segmented bolt-on type. Lifetime lubricated idler and rollers, and a reliable track tensioning arrangement should be provided. Extreme service single grouser shoes of not less than 560 mm width shall also be provided.

4.10 Dozer Attachment:

The Dozer shall be fitted with hydraulically controlled Semi –U tilt / Straight Tilt dozer attachment. The dozer blade shall be heavy-duty type with steel wear plates and heavy- duty end bits. Heavy duty hardened steel wear resistant cutting edges, which comply with ISO 7129 shall be provided.

4.11 Fuel tank:

The fuel tank shall be of sufficient capacity for 16 hours operation without refuelling, and be provided with a level indicator and a lockable-hinged cap.

Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Operator's Station:

A suitable Operator’s Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.12.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Non-slip type steps, walkways and handrails, which comply with ISO 2867, shall be provided for access to the operator's cabin. All directional movements, forward travel, reverse travel, gear selection, steering operation should be joystick / finger-tip/ suitable lever controlled (to be decided by subsidiary company). Joystick shall be provided for blade operation.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used i f they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.12.2 Operator's Protective Structures:

Dozer shall be equipped with FOPS as per ISO –ISO3449 & ROPS as per ISO 3471/ ISO 12117-2

4.12.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.12.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

In case of abnormal leakage of Engine oil/ Transmission oil in equipment, there shall be suitable mechanism to lower reduce rpm or provision of proper indication to alert the operator to stop the equipment in safe place.

4.12.5 Starting and Stopping System:

Dozer shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.
The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.13 Gauges and indicators/ Electronic Display:

The following shall be provided:

a) Water / coolant temperature gauge
b) Engine oil pressure gauge/ indicator
c) Transmission Oil Pressure Gauge
d) Fuel capacity gauge.
e) Engine tachometer
f) Engine hour-meter
g) Operating parameter & diagnostic code display

In case any of these gauge(s) is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.14 Warning Alarms / Lights/Indicator:

The following warning alarms shall be provided:

a) Coolant level and temperature
b) Engine oil pressure
c) Converter oil temperature (where applicable)
d) Front warning horn

e) Reversing –DGMS complied Audio Visual Alarm.

4.15 Electrical Equipment:

The dozer shall be provided with the following:

a) 24V DC electrical system with suitable rated alternator of reputed make
b) 24 V Electrical starter motor of reputed make
c) High capacity maintenance free batteries of reputed make.
d) Battery isolation switch / Relay

All Electrical wires & sleeves are to be of fire resistant quality to decrease chance of fire. Electrical wires are to be passed through flexible metallic conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/ circuit breakers.

4.16 Lighting:

Adequate lighting shall be provided for safe nightshift operation. All lighting system shall be of LED type.

The lighting system should include the following:

a) 4 nos. headlights
b) 2 nos. rear working lights
c) 4 nos. ROPS mounted working lights (2-front and 2-rear)
d) Cabin dome light

Headlights and rear working lights shall be identical in type and size and fitted in steel protective enclosures.

4.17 Guards and shields*:*

Adequate guards and shields, which comply with ISO 3457, shall be provided throughout the dozer.

4.18 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed lubrication points on the machine, except where use of high viscosity lubricants prevents the application of pumped systems.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of lubrication system shall be repeated on the instrument/ test panel (specified elsewhere).

Lubricant containers shall be located inside the machinery house / at suitable safe location and be large enough to cater for a minimum of 50 (fifty) hours continuous operation. The containers shall be fitted with suitable cleaning

arrangement.

All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced.

Lubricants used shall be preferably of reputed Indian make.

4.19 Fire Detection and Suppression System:

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area .
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for

AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.20 Fire Extinguisher:

A fire extinguisher shall be provided on the dozer, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS:15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Fire Extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS(Approval)CircularNo.02 dtd. 08thJuly2013.

Periodical refilling of fire extinguisher to be done by the supplier within the contract period.

4.21 Safety Features

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment

The following safety features shall be provided in the equipment

a) All function cut off switch
b) Roll over protection.
c) Turbocharger guard.
d) Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
e) Mirrors, right and left
f) Hot zones shall be separated from cold zone by providing baffle plate
g) Exhaust pipes and turbocharger shall be adequately guarded.
h) Blind spot mirror or any other device apart from rear view mirror to enable operator to have clear visibility of blind spot in and around dozer.
i) Retro Reflective Reflectors on all sides for visibility of dozer during night.
j) Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
k) Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
l) Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

5 Ancillary equipment and other requirements

a) Front pull hook
b) Rear mounted rigid draw bar

6 Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data to third party equipment management system.
The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

a) Working hour based on the duration of a shift for which the equipment is switched on for operation
b) Engine oil pressure & temperature
c) Coolant temperature
d) Coolant level
e) Engine RPM
f) Fuel level and fuel consumption rate
g) Hyd. oil temperature
h) Hyd. Oil Level in the tank
i) Engine electrical system - Battery voltage and Alternator out put
j) All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Dozer Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
2. The real time interface telemetry port will be provided in the equipment
3. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
4. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
5. There shall be integrated on board data management system as explained at point no.3 as above.
6. Permission to third party for interfacing, data collection through online port.
7. Signing of Non-disclosure agreement to protect intellectual property right on either side.
8. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
9. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment.

However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

7 Special Guarantees

The following guarantee will apply for the different components from the date of commissioning:

i) Main Frame –10,000 hours
ii) Complete engine system –6000 hours
iii) Transmission Assy. –6000 hrs
iv) Final Drive (excluding Sprocket) and Steering System –6000 hrs
v) Engine Hour Meter - 3000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item. The special guarantee shall be limited for the period of contract only

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of the Subsidiary Company shall be final and binding for both supplier and purchaser.

8 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are **4000 (Four thousand)** hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 80% (Eighty percent) annually for a period of 36 months from the date of accepted date of commissioning and 75% (seventy percent) annually for balance years of the contract period.

[[Note - Expected annual working hours and guaranteed availability may be

decided by subsidiary company as per actual requirement]

9 Expected life of major assemblies:

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
Dozers	Main Frame	
	Engine	

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
	Transmission/Torque Convertor	
	Electrical system	
	Final Drive (excluding sprocket) & steering system	
	Under Carriage – Track chain, Roller, Idlers & sprocket Teeth	

Note - * Expected life means life before first overhaul

10 Information to be provided by the supplier:

The supplier shall furnish the following information.

10.1 General:

i. Number of similar models supplied during the last **5 (Five)** years. The information shall be given in the following format and in the order of most recent first.

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self-certified.

ii. Details of special tools to be provided with the equipment.

iii. Details of erection programmes for the bid.

10.2 Technical Details:

i. Detailed technical descriptions and specifications of the dozer.
ii. Layout drawings and detailed descriptions of all machinery including method of power transmission, mounting details and method of alignment.
iii. Latest engine performance curves showing net power, net torque and specified fuel consumption of the installed engine, measured according to ISO 9249.
iv. Maximum travel speed determined according to ISO 6014
v. Calculation of volumetric rating of dozer blade in accordance with ISO 9246.
vi. Dozing Production Curves, showing the following.
    a. Production with offered blade at 30m distance.
    b. Production with offered blade at 60m distance.
vii. Comprehensive commercial literature specifications, the content of which must comply with ISO 6747
viii. Details of major bought-out assemblies and sub-assemblies including manufacturer's name with address, type, model etc.
ix. Detailed list of instrumentation monitoring and alarm systems.
x. Operation and maintenance manual.
xi. Schematic and layout drawings and details of the Supplier, number, function and type of Automatic fire detection and suppression System

10.3 Dimensions, Weight and Performance Details:

10.3.1 Dimensions:

a) Maximum overall length with and without blade (m)
b) Maximum overall width, with and without blade (m)
c) Maximum overall height (m)
d) Drawbar height (m)

10.3.2 Machine weights:

a) Shipping weights of individual components (kg)
b) Total Operating weight (Kg)
c) Operating weight excluding dozer attachment (kg)

10.3.3 Engine:

a) Manufacturer and Model
b) Number of cylinders
c) Bore (mm)
d) Stroke (mm)
e) Displacement (litre)
f) Net power at..... rpm (kw)
g) Maximum Torque (nm)

10.3.4 Transmission:

a) Make and Model
b) Number of gear speeds, forward and reverse

c) Travel speeds, forward and reverse (Km/h)

10.3.5 Differential:

a) Make and Model
b) Type
c) Ratio

10.3.6 Final Drive:

a) Type
b) Ratio

10.3.7 Steering and braking:

a) Type
b) Actuating System

10.3.8 Undercarriage:

a) Undercarriage overall width (m)
b) Crawler track height (m)
c) Crawler effective length (m)
d) Crawler width (m)
e) Crawler shoes, total number
f) Ground contact area (sq.m)
g) Ground bearing pressure (kpa)
h) Load rollers, diameter and number per crawler (m)
i) Driving Sprocket diameter (m)
j) Idler roller diameter (m)
k) Centre to centre of idler roller and sprocket, if applicable (m)

10.3.9 Hydraulic System:

a) Make, Model, Number, flow rates and operating pressures of pumps
b) Make, model, number and ratings of motors (where applicable)
c) Make, model, number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures (kpa)
e) Oil quantity in system and tank (ltrs)
f) Filtration system type

10.3.10 Dozer attachment:

a) Maximum digging depth (m)
b) Ground clearance at full lift (m)
c) Maximum tilt adjustment (m)
d) Maximum pitch adjustment (m)

10.3.11 Electrical System

a) Starter: make and model
b) Alternator: make and model
c) Batteries: numbers, voltage and no. of plates/AH rating
d) Lighting details

Equipment Acceptance

The Equipment ordered will be finally accepted subject to the Supplier demonstrating to the Purchaser or its authorised representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random by the Purchaser) when tested, meets the Performance Data provided by the Supplier in accordance with the requirements of clause 10. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturer's certified test copy for that parameter of performance data provided by the supplier in accordance with the requirements of clause10. A detrimental deviation of up to 2½% will be accepted.

1	Specific Fuel Consumption as per ISO 9249	To be tested at Works / Engine manufacturer plant and Minimum of 3 (three) readings at full load to be averaged. Manufacturer's test data in respect of fuel consumption in terms of gm/kw-hr is to be submitted.
2	Engine Net Power & RPM	Manufacturer's test report shall be submitted. However, the inspector should ensure the above during pre-dispatch inspection / acceptance of equipment at site to ensure acceptance of equipment.
3	Drawbar Pull at 1 km/h	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.
4	Production with offered blade at 30 m distance	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.
5	Production with offered blade at 60 m distance	To be tested at manufacturers Works. Details of test and relevant photographs of the testing procedure to be provided.

BLASTHOLE DRILLS

250MM Drill

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Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF CRAWLER MOUNTED, 250 MM, STANDARD /TALL MAST, ELECTRIC OPERATED ROTARY BLAST HOLE DRILL

1. **Scope of Specification:**

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-contained, self-propelled, crawler mounted,250mm, Standard /tall mast, electric, rotary blast hole drill (3.3 KV /6.6 KV).

2. **References;**

The following International Standards are referred to in, and form part of, the Specification

ISO 2867: Earth-moving machinery - Access System
ISO 3449: Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance
ISO 3457: Earth-moving machinery - Guards and shields - Definitions and Specifications ISO 6014: Earth-moving machinery - Determination of ground speed
ISO6405-1: Earth-moving machinery - Symbols for operator controls and other displays - Part I : Common symbols
ISO6405-2: Earth-moving machinery - Symbols for operator controls and other displays - Part II : Specific symbols for machines equipment and accessories
ISO 6747: Earth-moving machinery - Tractors - Terminology and commercial specifications
ISO 6750: Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7095: Earth-moving machinery - Crawler tractors and crawler loaders - Operator's controls

3. **Design Criteria**

The drill shall be capable of operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive sandstone/rock and slushy conditions.
The drill shall be suitable for drilling holes of 250mm diameter and have a single pass capacity of not less than **7.62m**/10 m and a total drilling depth capacity for minimum 4-rod drilling i.e., not less **30 meter** / 40 metre

The major assemblies and sub-assemblies must be suitably located to provide proper weight distribution so that the centre of gravity of the machine, with the mast both up and down, falls well within the machine to ensure stability during drilling and travelling up and down gradients. The total working weight of the machine should not be less than twice the pull- down force.

4. Mast

The mast should be rugged structural steel constructed of suitable length to accommodate rotary head, with a suitable guide for the rotary head. Rising and lowering of the entire mast shall be accomplished hydraulically with safety check valve/s to prevent the mast from falling in the event of power or hose failure. Raising and lowering of the mast should be possible with all the specified number of drill rods stored in the rack.

A mechanical / hydraulic lock shall be provided to hold the mast securely in the vertical drilling position. Mast hinge and hydraulic cylinder mounting points should have adequate lubrication to ensure easy movement of the mast.

A ladder, safety belt with fall arrester which automatically locks & prevents working personnel from falling from top of the mast & guiding system shall be provided for climbing on the mast/tower

5 Rotary Head

A suitably designed hydraulic / pneumatic motor should accomplish rotation, with variable speed range from 0-90 r/min. The available torque should not be less than 11000 Nm. A suitable arrangement should be provided to reduce shock loads and protect drill rod threads. The drill shall be provided with suitable bump circuit to reduce feed pressure while picking
/ dropping drill rods in loader

6 **Feed**

Feed should be accomplished by a suitably designed hydraulic motor/s and either a chain system with provision of automatic feed or an equivalent proven system. The pull-down force shall be not less than 31000 kg.

A direct reading vermin proof pressure gauge with vibration proof mounting shall be provided to measure the pull-down force.

7 Drilling Rods

The outside diameter of the drill rod should not be less than 219 mm. The wall thickness of the rods should be 22mm +/- 10%.The drill rods should preferably be provided with BECO threads and hexagonal / square head / slot at rod ends for screwing and unscrewing arrangement. The hoisting of drill rods should be achieved through a suitably designed system with sufficient hoisting capacity for efficient operation of the machine. The drill should also have a suitable drill stem loader for easy transfer of rods.

The drill shall have one rod in rotary &three rod in carousal.

The drill shall be provided with suitable hydraulic breakout wrench for breaking the tool joints. This should be operated from cabin, without manual intervention

8 Depth Indicator

The system should display continuously hole depth, rate of penetration, distance from the bottom of the hole & accumulated depth.

9 **Centralized Roller Deck Bushing**

Suitable centralized roller deck bushing should be provided which help to reduce torque on the drill rotary motor by reducing friction between the pipe & the deck bushing

10 Auto Thread Lubrication System

The auto lubrication system should be provided to reduce the damage of rod.

11 Leveling

The drill shall be provided with suitable hydraulic levelling jacks and a spirit level in the operator's cab for quick levelling of the machine. The jacks shall be provided with safety check valves.

12 Undercarriage

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. The undercarriage shall be with an adequate quantity of supporting track and carrier rollers each side and provided with a track of suitable length and width to ensure that the ground bearing pressure does not exceed 100kPa. It shall be of welded construction and stress relieved as required. Proper track tensioning arrangement shall be provided. Rollers and idlers should be life time lubricated. The machine shall be provided with a tow-bar. The make of undercarriage and calculation of ground bearing pressure to be specified.

13 Propel

An independent hydraulic motor driven propel system driving the track sprocket shall be provided with in-built fail-safe braking arrangement. The propel brakes shall be disc type and shall have suitable brake valve. The propel joy stick should be of spring loaded type to return to neutral. The drive system shall allow the machine to be towed. The braking system shall be so designed that it is able to stop the drill under all traveling conditions. A propel interlock (an interlock between drilling & propeller operation) and lock check valve for preventing creeping, should be provided.

14 Compressor

The drill shall be fitted with a proven quality screw type compressor of capacity not less than 28 Cum/min free air at a minimum pressure of 689 kPa (7.03 Kg/Sq.cm).

The compressor should be equipped with un-loader control system and proper lubrication/cooling system. The compressor should have 2-stage air filtration. It should also have pressure gauge, safety valve for discharge lines and oil level indicator. The compressor oil filter clogging indicator shall be provided. High air discharge temperature switch shall be provided.

An oil stop valve (electric / pneumatic solenoid valve) should be provided in compressor lubrication line.

15. Hydraulics

The hydraulics should be powered through the prime mover for operating (where applicable) propel, feed, rotation, leveling jacks, mast articulation, hoist system, breakout wrench, etc. The hydraulic pumps, motors and cylinders should be field proven and have suitable ratings with in-built protection from surge, cavitation, loss of oil due to hose leakage or burst, etc. As far as practicable reputable single make pumps, motors, cylinders and valves, etc. shall be used in the machine. Hydraulic return oil filtration system with clogging indicators is to be provided.

A suitable system shall be provided for effective cooling of the hydraulic oil to improve the life of hydraulic components.
The bidder shall fully describe each component of the hydraulic system

16 **Hoses**

Hoses shall be Fire resistant/ Fire retardant type near hot zone and all hoses shall be grouped as far as possible and suitably clipped to lessen damage from scuffing. Any hydraulic hoses located within the operator's cab should be guarded sufficiently to deflect fluid under pressure, should a leak develop.

17 **Filters**

The filtration system for the compressor and hydraulic system must be so designed that the rated life of compressor and hydraulic components can be obtained, considering the dusty mine environment / conditions in which the drill will have to work. All compressor & hydraulic Filters shall be fitted with filters clogging indicator. The absolute micron rating of hydraulic and compressor filters should be as per the respective system design specifications but preferably be not more than 10 micron at a minimum beta ratio of 75. The filter sizing, flow capacity and dirt holding capacity should be adequate enough to provide long filter change frequency.

All filters for the compressor and hydraulic system must be so designed that the rated life of compressor and hydraulic components can be obtained, considering the specified dusty duty conditions in which the drill will have to work.

18 **Machinery House/Deck**

The machinery house/deck shall be made of steel sheeting supported by a steel structure and shall cover the engine, compressor and drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance. Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator’s cab and service platforms and shall comply with ISO 2867.
The space in and around the major assemblies housed in the machinery deck be sufficient to give ready and safe access to personnel and tools & tackles for maintenance.

19 **Dust control system**

The drill shall be provided approved type NVE type dust prevention and suppression systems to eliminate dust hazards to the operator, equipment and environment.

In addition to above, the drill shall also be provided with wet type water injection system for dust suppression. The system shall provide water spray / mist over the whole mouth and within the dust hood assembly. The water tank shall have enough capacity for at least two shift operation of drill.

Dust prevention or suppression system provided in the Drills shall confirm to DGMS circular no. DGMS(S&T)/ circular (Approval) No 1, dated 10.03.2017.

20 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018

20.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

20.2 Operator's Protective Structures:

Drill shall be equipped with an integral FOPS which complies with ISO 3449.

20.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be padded and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

20.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self- acting or shall act by compulsory actuation of the relevant device.

20.5 Starting and Stopping System:

Drill shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls.

21 Guards & Shields

a) Adequate guards and shields shall be provided throughout the drill
b) Each moving part of the machinery shall be guarded / fenced and also ensure its effectiveness all the time

22 Gauges, indicators and switches: The following shall be provided

(i) Input Voltmeter & Ammeter gauge
(ii) Depth indicator
(iii) Hydraulic oil temperature and pressure gauge/ indicator
(iv) Compressor pressure gauge
(v) M/c level indicator

23 Electrical specification

23.1 Power Supply - The electrical power supply to the machine will be 3.3 KV /6.6 kV (+/- 10%), 50Hz (+/- 3%),3 phase. This will be provided via a trailing cable from the mine electrical distribution network. The machine shall be capable of accepting supply. All high-tension electrical equipment shall have an insulation rating of 12 kV to protect against a rise in potential across any one phase of the supply.

An isolator switch shall be provided in the machine for disconnecting the main incoming supply line.

A suitable distribution switchboard shall be provided to supply the various machine drive, control and auxiliary sub-circuits. Each switch forming part of the switchboard shall comprise an on-load isolator, an electrically closed and tripped, vacuum contactor and fitted with protection against overload, short circuit and earth fault and appropriate control push buttons, indicators and alarms. Indication of the state of the switch and any fault condition shall be provided on the front of the switch panel.

23.2 Drive System

A) The electrical drive systems must be so designed that all the functions of the equipment have optimum output with high mechanical efficiency, low maintenance cost and improved maintainability and component life.

B) Each drive system shall be energized from a suitably rated vacuum starter control panel providing overload, short circuit, single phase, reverse phase sequence, earth fault and under voltage protection

C) Any motors used as prime movers should be capable of being remotely started from a control/instrument panel located in the machinery house. A remote stop facility shall be provided in the operator's cab.

D) All motors shall be AC, and continuously rated for the duty specified. Minimum Insulation class should be of class-F,

E) The control circuits for each drive shall be housed in a steel cabinet provided with internal illumination. The cabinets shall be dust and vermin proof. Suitable cooling fans with dust filtering facilities for the cabinets shall be provided.

F) Anti-condensation heaters shall be fitted to all major drives and electrical cabinets wherever applicable

G) All control circuits shall operate at 110V/220V, single-phase 50Hz. with earthed neutral. The electrical supply for other items shall be either 415V 3 phase 50Hz or 110V/220V, 50Hz, single phase with earthed neutral, as appropriate

H) Control circuit transformers shall be protected on their primary side by isolation switches and fuses. Control circuits shall be protected on one side of the transformer by a fuse with the opposite side connected to earth.

I) All cables used in the machine shall be of the fire resistant type

23.3 Trailing Cable

A) The machine shall be provided with 300 meters of 3.3KV/6.6 kV, 6 core trailing cable of adequate cross section in relation to the rating of machine and the 50 degree C ambient temperature. The cable shall be of the flexible type suitable for use with open pit mining machinery

B) The cable shall have 3 power cores of equal adequate cross section individually screened with metallic ATC (Annealed Tinned Copper) wire & specially formulated semi-conducting compound, 2 earth cores of equal cross section of minimum size of 50% of size of power core and one pilot core of not less than 16 sq. mm size.The Trailing cable shall generally conform to IS:14494-1998. The cable should have minimum insulation level of 8KV for 3.3KV / 15 kV for 6.6kV circuit.

C) The drill shall be provided with a weatherproof box termination, located at the rear i.e., non-drilling end for trailing cable.

23.4 Power Factor Correction and Harmonic Suppression

(a) The electrical circuit shall include suitable arrangements for power factor correction to ensure that the average power factor over the whole cycle is at least 0.9 lag.

(b) The electrical circuits shall have adequately designed harmonics suppression networks for reducing harmonics and transients to acceptable levels, where ever applicable

23.5 Field Switch

a) The drill should be provided with a skid-mounted field switch. The switch shall be of robust construction suitable for the rugged terrain and the mining conditions for which it will be used. It shall also be dust and vermin proof and protected to withstand torrential monsoon rains. Illumination shall be provided within the enclosure.

b) The switchgear should be of vacuum circuit breaker (VCB) type with symmetrical rupturing capacity of 75MVA/ 150MVA at 3.3KV/ 6.6 kV. The field switch shall also have earth fault, overload, under voltage, single phase, and thermal & reverse phase sequence protection relays. In an emergency it should be possible to trip the field switch from operator's cabin by a push button switch.

c) Suitable facilities shall be provided for the termination of supply cables. Earth connection stud shall be provided on each terminal box and on the main body of the switch casing. It shall be possible to feed through the switch to other similar units. Blank plates and adapters shall be provided to safely seal the feed-through termination against the elements when not in use.

23.6 Lighting

Adequate LED lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. The lighting fixtures shall be supplied at 220 V /110V/24V. Earth leakage protection to be provided with lighting circuit breaker

23.7 Instrument/ Test/ Alarm Panels

Instrument/test/alarm panels shall be provided to measure critical parameters of the power and control circuits to assist maintenance and repair operations. Indications of the following are to be provided:

a) Incoming voltage current, power consumption and power factor
b) Monitoring facilities shall be provided for the following, where applicable.
c) AC circuit faults
d) Transformer over temperature
e) Bearing Over temperature
f) Air pressure loss
g) Frequency fluctuation
h) Power supply error

All instruments provided with the machine shall comply with Indian Standard 1248 industrial accuracy and shall be vibration proof type

23.8 Transformers

All transformers shall be of reputable manufacture, suitably rated for the duty specified and the operating environment. The transformers shall be delta-star connected with star points earthed for each fault protection. Oil filled transformers shall have suitable protection against oil over-temperature and "gassing" (Bucholz etc.). The transformer shall have suitable Explosive vent to protect the transformer.

23.9 Auxiliary Equipment

The power supply to any auxiliary equipment shall be either 415V 3 Phase 50Hz or 220V/110V, 50Hz, single phase with earthed neutral as appropriate. Care should be taken with the use of single-phase circuits to ensure that the loads are balanced across the three-phase supply to avoid tripping of starter.

23.10 Limit Switches & Interlocks

Limit switches interlocked with the relevant control circuit shall be provided [where necessary].

Interlocking shall be provided to allow safe access to all high voltage areas after isolation of the incoming supply to the drill. All electrical circuits shall be protected by adequately rated fuses/ MCB, which shall be easily accessible for maintenance. Drill shall have suitable propel interlock (electric) between drilling and propeller operation to avoid the damage of drill rod

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24 **Safety features:**

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment:

a. Approved type ofdust prevention or suppression system.
b. Each moving parts of the machinery shall be guarded /fenced and also ensure its effectiveness all the time.
c. Emergency push button in
    i. Operator Cabin
    ii. Main frame
    iii. Propeller Pendent
    iv. Rear end
d. Propel Interlock (an interlock between drilling & propel operation)
e. High air discharge temperature trip switch
f. Low lube oil pressure cut off switch (compressor)
g. Oil stop valve (Electric solenoid valve in compressor lubrication line)
h. No bump circuit-Should comply as per requirement of Clause 11 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
i. Tower lock
j. Propel Joystick- spring loaded type to return to neutral (dead man safety)- Should comply as per requirement of Clause 13 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020.
k. Disk brake & brake valve & its testing parameters
l. Lock Check valve for preventing creeping in drill
m. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
n. Fire resistant/retardant hydraulic hoses and wiring near hot zone
o. Over Temperature protection devices, in motor winding and other related parts

p. Break Out Wrench - Should comply as per requirement of Clause 12 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020Tripping device to trip the field switch
q. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
r. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
t. Thermostat Motor protection relay for control of winding temperature and other related parts

25 **Automatic lubrication system:**

A centralized PLC based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine,

including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD (Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

26 **Fire Extinguishers**

Adequate number of fire extinguisher shall be provided at strategic point on the Drill, suitably mounted in a heavy-duty bracket with ease of dismounting. The extinguisher shall be of dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian standard IS 15683:2006

The materials and chemicals to be used in all the fire extinguisher and automatic fire detection and suppression system to be supplied with equipment must be of a type and make conforming to DGMS Circular: DGMS (approval) Circular No. 02 Dated 08.07.2013.

27. **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5** of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Drill.

- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick clean up and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Periodical refilling and maintenance to be done by the supplier during the contract period

28 **Additional Requirement**

The following shall be Provided

a) Remote control propel.
b) 110V/220V portable electric blower
c) Adequate 440V/415V 3 phases, 50 Hz welding power outlets suitably located so that welding can be carried out at any point on the machine.
d) A 440V/415V 3 phases 50 Hz, 500 amps Thyristorised Welding machine with accessories
e) Adequate 220V/110V single phase, hand held inspection outlets, portable hand lamps and all necessary

f) Workbench fitted with vice and tool chest.
g) Megger 5 kV and Megger 1 kV
h) Digital Multi-meter (heavy-duty)
i) Hour meter
j) Hydraulic Jack 35T - 1 No
k) 250 mm steel TC / tooth rock roller drill bits (To be decided by subsidiary company) 4 (four) nos
l) Tow Bar
m) Cable reeling Drum
n) Centralized Roller Deck Bushing
o) Depth Indicator
p) Auto Thread Lubrication
q) Drill Efficiency Indicator (DEI)
r) Safety ladder with Safety Belt and Automatic Fall arrestor

29 **Special Guarantees**

The following guarantees shall apply for the different components, from the date of commissioning:

i) Body, Chassis: 10000 hrs from the date of commissioning
ii) Under Carriage –5000 hrs from the date of commissioning
iii) Automatic Lubrication System: 24 months or 5000 hrs (whichever is earlier)
v) Dust Control System – 24 months or 5000 hrs (whichever is earlier)
vi) Compressor Assy.: 6000 hrs. from the date of commissioning
i) Hydraulic Pumps / Motors / Cylinders / Leveling Jacks: - 24 months or 6000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period. However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

30 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 the Technical Specifications, the expected scheduled working hours of the equipment per year are 3000 (three thousand) hours.

[The bidder should note that the expected scheduled working hour indicated are only approx. hour and there may be variation in the range +/- 500 hours].

In accordance with the provisions of C 7.2.2 and C 7.3.2 of the

Technical Specifications, the Supplier shall guarantee that the availability of the equipment shall be not less than 85% (Eighty five percent) for the entire contract period from the accepted date of commissioning

[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

31 **Information to Be Provided by The Supplier**

The Supplier shall furnish the following information. All technical information shall be in SI units.

31.1 **General**

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format and in the order of most recent first:
Company-Mine Name-Mine Location- Mine Type- No of machine –
Model-Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer.

c) Details of tools to be provided with the equipment.

d) Details of erection programmes for the equipment.

e) Details of maintenance schedule.

31.2 **Technical Details**

a) Detailed technical description and specification of the drill

c) Layout drawings and detailed descriptions of all machinery including method of power transmission, mounting details and method of alignment.

d) Performance curves for all motions.

e) Layout drawings and complete hydraulic and air circuit with detailed descriptions of all component

f) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.

g) Comprehensive commercial literature specifications.

h) Operation and maintenance manuals

i) Make, Details & layout of fire detection & suppression system

j) Make, Details & layout of Automatic lubrication system

k) Details of the type and method of drive systems offered.

l) Details with working functions of Depth indicator fitted in the machine

m) Details of dust control system

n) Method of power factor correction

o) Lighting Details

31.3 **Dimensions, Weights and Performance Details**

31.3.1 **Working Ranges**

a) Hole size range
b) Drilling Depth – Single Pass
c) Total Drilling Depth

31.3.2 **Performance**

a) Pull-down capacity
b) Bit load at peak power
c) Feed rate at peak power
d) Hoisting Capacity
e) Hoisting Speed
f) Bailing Velocity
g) Maximum propel speed
h) Gradeability
    * Mast raised
    * Mast lowered
i) Maximum Rotary Motor Torque
j) Rotational Speed Range

31.3.3 **Machine Weights**

a) Construction
b) Operating

31.3.4 **Basic Dimensions**

a) Length
Mast raised
Mast Lowered
b) Width
c) Height
Mast raised
Mast lowered
d) Mast length

31.3.5 **Hydraulic System**

a) Make, Model, Number, flow rates and operating pressures of pumps
b) Make, Model, Number and ratings of motors
c) Make, Model, Number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures
e) Oil quantity in system and tank
f) Filtration system type.

31.3.6 **Feed**

a) Type, make & model of feed chain (if applicable)
b) Feed rate

31.3.7 **Make, Model, Type, Quantity & kW / HP of Motors for each of the following:**

a) Compressor
b) Rotation
c) Pull down
d) Propel

31.3.8 Power voltages and frequency (Indicating the fluctuations these can be subjected to)

31.3.9 Power factor at rated load

31.3.10 Transformer rating

31.3.11 **Carousal**

a) Number of rods
b) Rod Length
c) Rod diameter
d) Rod wall thickness

31.3.12 **Levelling Jacks**

a) Rear jacks - Make, number, stroke and piston diameter
b) Front jacks - Make, number, stroke and piston diameter
c) Pad diameter - Front and Rear.

31.3.13 **Tracks**

a) Make of undercarriage
b) Width & Length
c) Number of bottom rollers
d) Number of carrier rollers
e) Ground bearing pressure
f) Track link pitch
g) Centre distance between sprocket and idler

31.3.14 **Compressor**

a) Manufacturer and model
b) Discharge rate
c) Pressure

31.3.15 **Drilling Cycle (Based upon a cycle of drilling ten 20 m holes)**

a) Start-up time
b) Drilling Time
c) Tramming Time
d) Fuel Consumption ltr/hr

31.3.16 **Trailing Cable Specification** (indicating make and conformity to relevant IS and IE rule)

31.3.17 **Rotation**

a) **Motor**
Type, Make &
Model Nos.,
total HP & RPM
Maximum Rotational torque
Rotational speed at peak power
Rotation speed range

b) **Gear Box**
Type, make &
model ratio

Equipment Acceptance

The equipment ordered will be finally accepted subject to the supplier demonstrating to the purchaser or its authorized representative (may be third party) that the equipment when tested as indicated below meets the performance data provided by the supplier. A detrimental deviation of up to 2.5% will be accepted.

a. Cycle Time: To be tested at site after commissioning under operating conditions as stated in the ITB. The equipment may be operated at the Supplier's discretion either by the supplier's personnel (who are to be deployed for training) or by the Purchaser's personnel who are to be authorized by the supplier.

b. Rotational Performance and Pull down Performance: To be tested at Works or at Project site(s) - shall be mutually decided at the final stage of order.

160MM Drill

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF CRAWLER MOUNTED 160MM, STANDARD MAST, DIESEL DRIVEN, ROTARY BLAST HOLE DRILL

1 Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a self-contained, self-propelled, crawler mounted 160mm, standard mast, diesel driven, rotary blast hole drill.

2 References;

The following International Standards are referred to in, and form part of, the Specification

ISO 2867: Earth-moving machinery - Access System
ISO 3449: Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance
ISO 3457: Earth-moving machinery - Guards and shields - Definitions and Specifications ISO 6014: Earth-moving machinery - Determination of ground speed
ISO6405-1: Earth-moving machinery - Symbols for operator controls and other displays - Part I : Common symbols
ISO6405-2: Earth-moving machinery - Symbols for operator controls and other displays - Part II : Specific symbols for machines equipment and accessories
ISO 6747: Earth-moving machinery - Tractors - Terminology and commercial specifications
ISO 6750: Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 9249: Earth-moving machinery - Engine test code - Net power requirements.

3. Design Criteria

The drill shall be capable of operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive sandstone/rock and slushy conditions.
The drill shall be suitable for drilling holes of 160mm diameter and have a single pass capacity of not less than 7.62 m and a total drilling depth capacity for minimum 3-rod drilling.
The major assemblies and sub-assemblies must be suitably located to provide proper weight distribution so that the centre of gravity of the machine, with the mast both up and down, falls well within the machine to ensure stability during drilling and travelling up and down gradients. The total working weight of the machine should not be less than one and half times the pull down force.

4. Diesel Engine

The drill shall be powered by a direct injection, 4-stroke diesel engine of

not less than 200 kW net power measured between 1700 and 2000 r/min.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier III or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for EPA Tier III or above or equivalent from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise (1 no. laptop for a fleet up to 3 nos. or part there off for each project) along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

5. **Hydraulics**

The hydraulics should be powered through the diesel engine for operating (where applicable) propel, feed, rotation, leveling jacks, mast articulation, hoist system, breakout wrench, etc. The hydraulic pumps, motors and cylinders should be field proven and have suitable ratings with in-built protection from surge, cavitation, loss of oil due to hose leakage or burst, etc. As far as practicable reputable single make pumps, motors, cylinders and valves, etc. shall be used in the machine. Hydraulic return oil filtration system with clogging indicators are to be

provided.

A suitable system shall be provided for effective cooling of the hydraulic oil to improve the life of hydraulic components.
The bidder shall fully describe each component of the hydraulic system

6 **Hoses**

Hoses shall be Fire resistant/fire retardant near hot zone and all hoses shall be grouped as far as possible and suitably clipped to lessen damage from scuffing. Any hydraulic hoses located within the operator's cab should be guarded sufficiently to deflect fluid under pressure, should a leak develop.

7 **Mast**

The mast should be rugged structural steel constructed with a suitable guide for the rotary head. Rising and lowering of the entire mast shall be accomplished hydraulically with safety check valve/s to prevent the mast from falling in the event of power or hose failure. Raising and lowering of the mast should be possible with all the specified number of drill rods stored in the rack.
A mechanical / hydraulic lock shall be provided to hold the mast securely in the vertical drilling position. Mast hinge and hydraulic cylinder mounting points should have adequate lubrication to ensure easy movement of the mast.
A ladder, safety belt with fall arrester which automatically locks & prevents working personnel from falling from top of the mast & guiding system shall be provided for climbing on the mast/tower

8 **Rotary Head**

A suitably designed hydraulic / pneumatic motor should accomplish rotation, with variable speed range from 0-90 r/min. The available torque should not be less than 3,200 Nm. A suitable arrangement should be provided to reduce shock loads and protect drill rod threads.

9 **Feed**

A suitably designed hydraulic / pneumatic motor should be accomplishing feed, with either a chain system with the provision of automatic feed or an equivalent proven system. The pull down force shall not be less than 13,600 Kg.
The feed rate i.e. free rotary head travel rate at peak power should not be less than 12 m/min
A direct reading pressure gauge, with vibration proof mounting, shall be provided to measure the pull down force.

10. **Drilling Rods**

The outside diameter of the drill rod should not be less than 127 mm.The wall thickness of the rods should be 10mm +/- 5%.The drill rods should preferably be provided with BECO threads and hexagonal / square head / slot at rod ends for screwing and unscrewing arrangement.The hoisting of drill rods should be achieved through a suitably designed system with sufficient hoisting capacity for efficient operation of the machine. The drill should also have a suitable drill stem

loader for easy transfer of rods.
The drill shall have one rod in rotary & two rod in carousal.
The drill shall be provided with suitable hydraulic breakout wrench for breaking the tool joints. This should be operated from cabin, without manual intervention. Auto Rod centering arrangement for multi rod drilling operated from the cabin should also be provided.

11 **Leveling**

The drill shall be provided with suitable hydraulic levelling jacks and a spirit level in the operator's cab for quick levelling of the machine. The jacks shall be provided with safety check valves.

12 **Undercarriage**

The undercarriage shall be heavy duty and of sufficient strength to withstand the high loads which may occur due to uneven ground conditions. The undercarriage shall be with an adequate quantity of supporting track and carrier rollers each side and provided with a track of suitable length and width to ensure that the ground bearing pressure does not exceed 100kPa +10%. It shall be of welded construction and stress relieved as required. Proper track tensioning arrangement shall be provided. The sprocket should be a single piece type. Rollers and idlers should be life time lubricated. The machine shall be provided with a tow-bar. The make of undercarriage and calculation of ground bearing pressure to be specified.

13 **Propel**

An independent hydraulic motor driven propel system driving the track sprocket shall be provided with in-built fail-safe braking arrangement. Disc brake along with brake valve and its testing parameters must be provided. The propel joy stick should be of spring loaded type to return to neutral. The drive system shall allow the machine to be towed. The braking system shall be so designed that it is able to stop the drill under all traveling conditions. A propel interlock (an interlock between drilling & propeller operation) and lock check valve for preventing creeping, should be provided.

14 **Compressor**

The drill shall be fitted with a proven quality screw type compressor of capacity not less than 600cfm (17cum/min) free air at a minimum pressure of 450kPa (4.57 Kg/Sq.cm).
The compressor should be equipped with un-loader control system and proper lubrication/cooling system. The compressor should have 2 -stage air filtration. It should also have pressure gauge, safety valve for discharge lines and oil level indicator. The compressor oil filter clogging indicator shall be provided. High air discharge temperature switch shall be provided.
An oil stop valve (electric / pneumatic solenoid valve) should be provided in compressor lubrication line.

15 **Filters**

All filters for the compressor and hydraulic system must be so designed that the rated life of compressor and hydraulic components can be

obtained, considering the specified dusty duty conditions in which the drill will have to work.

16 **Machinery House/Deck**

The machinery house/deck shall be made of steel sheeting supported by a steel structure and shall cover the engine, compressor and drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance. Non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator's cab and service platforms and shall comply with ISO 2867.

The space in and around the major assemblies housed in the machinery deck be sufficient to give ready and safe access to personnel and tools & tackles for maintenance.

17 **Dust control system**

The drill shall be provided approved type NVE type dust prevention and suppression systems to eliminate dust hazards to the operator, equipment and environment.
In addition to above, the drill shall also be provided with wet type water injection system for dust suppression. The system shall provide water spray / mist over the whole mouth and within the dust hood assembly. The water tank shall have enough capacity for at least two shift operation of drill.

Dust prevention or suppression system provided in the Drills shall confirm to DGMS circular no. DGMS(S&T)/ circular (Approval) No 1, dated 10.03.2017.

18 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018

18.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration- suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405- 1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use

of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Steps and handrails of robust design, which comply with ISO 2867, shall be provided for access to the operator's cab.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

18.2 Operator's Protective Structures:

Drill shall be equipped with an integral FOPS which complies with ISO 3449.

18.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

An additional seat for a trainer installed in the Operator's Station, shall be padded and shall provide adequate space for the trainer. The trainer shall also have available a conveniently placed handhold.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

18.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while

the operator is getting into or out of the operator's station. The deactivation device shall either be self- acting or shall act by compulsory actuation of the relevant device.

18.5 Starting and Stopping System:

Drill shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement).

19. **Gauges, indicators and switches: The following shall be provided**

(i) Engine water temperature gauge
(ii) Engine and pressure gauge/ indicator
(iii) Engine tachometer
(iv) Engine hour meter
(v) Compressor pressure gauge
(vi) M/c level indicator
(vii) Hydraulic Oil Temperature Gauge

In case any of these gauge(s)/indicator is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

20 **Safety features:**

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices are incorporated in the equipment

1. Approved type of dust prevention or suppression system.
2. Each moving parts of the machinery shall be guarded /fenced and also ensure its effectiveness all the time.
3. Emergency push button in
   (a) Operator Cabin
   (b) Main frame
   (c) Propeller Pendent
   (d) Rear end
4. Propel Interlock (an interlock between drilling & propel operation)
5. High air discharge temperature trip switch
6. Low lub oil pressure cut off switch(Engine& compressor)
7. Oil stop valve (Electric solenoid valve in compressor lubrication line)
8. No bump circuit-Should comply as per requirement of

Clause 11 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

9. Tower lock
10. Propel Joystick- spring loaded type to return to neutral (dead man safety)- Should comply as per requirement of Clause 13 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
11. Disk brake & brake valve & its testing parameters
12. Lock Check valve for preventing creeping in drill
13. Seat belt &Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
14. Fire resistant/ retardant hydraulic hoses and wiring near hot zone
15. Turbo Charger Guard
16 Break Out Wrench - Should comply as per requirement of Clause 12 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
17. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
18. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020

21 **Electrical Equipment**

The drill shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make
b) Electric start
c) Reputable make high capacity maintenance free batteries
d) Battery isolation switch

Electric wires are to be passed through flexible metallic conduit to avoid damage to insulation. All electrical Circuits shall be protected by adequately rated fuses/ circuit breaker.

22 **Lighting**

Adequate LED lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation.

23**Automatic lubrication system:**

A centralized PLC/ microprocessor / microcontroller based hydraulic/Air/Electric operated, automatic lubrication system shall be provided to service all lubrication points on the machine, including those points where use of high viscosity lubricants is required.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all points of major parts. The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications for failure of lubrication system shall be provided and shall be repeated in the OBD

(Onboard Display) of operator's cab.

Lubricant containers of adequate size shall be located in a separate room / enclosure inside the machinery house / convenient location and be large enough to cater lubrication needs for continuous operation between refills. The containers shall be fitted with suitable arrangement for cleaning and refilling

All lubrication lines and injectors shall be protected from damage. Location of all injectors shall be such that these can be conveniently inspected and repaired. The lubrication lines to the remote points should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Preferably steel piping shall be used for long runs and shall terminate in steel junction blocks or rigidly mounted bulk head connectors to prevent disturbance to steel piping when flexible hoses are replaced.

Fire/heat resistant/ retardant hoses shall be provided in lubrication system. Lubricants recommended shall be of reputed make with Indian equivalent, if available.

Note: Maintenance of lubrication system shall be done by the supplier during the contract period

24**Fire Extinguishers**

A fire extinguisher shall be provided on the dumper, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08thJuly2013**.

Periodical refilling of fire extinguishers shall be done by the supplier during the contract period

25. **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.

- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

26 **Additional Requirement**

The following shall be supplied with the drill.

a) 160mm drill bits - 2 nos (The drill bit supplied should be compatible with the rock strata of the project)
b) Tow Bar
c) Centralized Roller Deck Bushing
d) Depth Indicator
e) Auto Thread Lubrication
f) Drill Efficiency Indicator (DEI)
g) Safety ladder with Safety Belt and Automatic Fall arrestor

27 Special **Guarantees**

The following guarantees shall apply for the different components, from the date of commissioning:

a) Body, Chassis: 10000 hrs from the date of commissioning.
b) Under Carriage – 5000 hrs from the date of commissioning
c) Automatic Lubrication System: 24 months or 5000 hrs (whichever is earlier)
d) Dust Control System – 24 months or 5000 hrs (whichever is earlier)
e) Compressor Assy.: 6000 hrs from the date of commissioning
f) Hydraulic Pumps / Motors /Cylinders / Leveling Jacks: - 24 months or 6000 hrs

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

28 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 the Technical Specifications, the expected scheduled working hours of the equipment per year are 3000 (three thousand) hours.

[The bidder should note that the expected scheduled working hour indicated are only approx. hour and there may be variation in the range +/- 500 hours].

In accordance with the provisions of C 7.2.2 and C 7.3.2 of the Technical Specifications, the Supplier shall guarantee that the availability of the equipment shall be not less than 85% (Eighty five percent) for a period of 12 months from the accepted date of commissioning

[[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

29 **Information To Be Provided By The Supplier**

The Supplier shall furnish the following information.All technical information shall be in SI units.

General

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format and in the order of most recent first:
Company-Mine Name-Mine Location-Mine Type-No of

machine –
Model-Comm.Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer.
c) Details of tools to be provided with the equipment.
d) Details of erection programmes for the equipment.
e) Details of maintenance schedule.

Technical Details

a) Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO 9249 with test bed data from manufacturer of Engine or OEM
b) Detailed technical description and specification of the drill
c) Layout drawings and detailed descriptions of all machinery including method of power transmission, mounting details and method of alignment.
d) Performance curves for all motions.
e) Layout drawings and complete hydraulic and air circuit with detailed descriptions of all components
f) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
g) Comprehensive commercial literature specifications.
h) Operation and maintenance manuals
i) Make,Details & layout of fire detection & suppression system
j) Make, Details & layout of Automatic lubrication system

Dimensions, Weights and Performance Details

Working Ranges

a) Hole size range
b) Drilling Depth – Single Pass
c) Total Drilling Depth

Performance

a) Pull-down capacity
b) Bit load at peak power
c) Feed rate at peak power
d) Hoisting Capacity
e) Hoisting Speed
f) Bailing Velocity
g) Maximum propel speed
h) Gradeability
   * Mast raised
   * Mast lowered
i) Maximum Rotary Motor Torque
j) Rotational Speed Range

Machine Weights

a) Construction
b) Operating

Basic Dimensions

a) Length
b) Mast raised
Mast Lowered
c) Width
d) Height
Mast raised
Mast lowered
e) Mast length

Engine

a) Manufacturer and model
b) Number of Cylinders
c) Bore
d) Stroke
e) Displacement
f) Net power at..... r/min
g) Maximum torque
h) Specific Fuel Consumption @ rated power

Hydraulic System

a) Make, Model, Number, flow rates and operating pressures of pumps
b) Make, Model, Number and ratings of motors
c) Make, Model, Number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures
e) Oil quantity in system and tank
f) Filtration system type.

Feed

a) Type, make & model of feed chain (if applicable)
b) Feed rate

Rotation

a) **Motor**
Type, Make &
Model Nos.,
total HP & RPM
Maximum Rotational torque
Rotational speed at peak power
Rotation speed range
b) **Gear Box**
Type, make &
model Ratio

Description of Dust control system

Carousal

a) Number of rods
b) Rod Length
c) Rod diameter
d) Rod wall thickness

Leveling Jacks

a) Rear jacks - Make, number, stroke and piston diameter
b) Front jacks - Make, number, stroke and piston diameter
c) Pad diameter - Front and Rear.

Tracks

a) Make of undercarriage
b) Width & Length
c) Number of bottom rollers
d) Number of carrier rollers
e) Ground bearing pressure
f) Track link pitch
g) Centre distance between sprocket and idler

Compressor

a) Manufacturer and model
b) Discharge rate
c) Pressure

Electrical Systems

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting Details

Drilling Cycle (Based upon a cycle of drilling ten 20 m holes)

a) Start-up time
b) Drilling Time
c) Tramming Time
d) Fuel Consumption ltr/hr

Equipment Acceptance

The equipment ordered will be finally accepted subject to the supplier demonstrating to the purchaser or its authorized representative (may be third party) that the equipment when tested as indicated below meets the performance data provided by the supplier. A detrimental deviation of up to 2.5% will be accepted.

a. Hourly Diesel Consumption: To be tested at site on 30 (thirty) operating days average immediately after commissioning under operating conditions as stated in the ITB (Information to be provided by the Bidder). The equipment may be operated at the supplier's discretion either by the supplier's personnel or by the Purchaser's personnel who are to be authorized by the supplier.

b. Cycle Time: To be tested at site after commissioning under operating conditions as stated in the ITB. The equipment may be operated at the Supplier's discretion either by the supplier's personnel (who are to be deployed for training) or by the Purchaser's personnel who are to be authorized by the supplier.

c. Rotational Performance and Pull down Performance: To be tested at Works or at Project site(s) - to be mutually decided at the final stage of order.

280HP Tyre Mounted Motor Grader
[Engine Net Power Range 270 HP – 290 HP]

PART D:- EQUIPMENT SPECIFICATIONS

Equipment Specification of a tyre mounted motor Grader (Engine Net Power Range 270 HP – 290 HP)

1. Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning for a diesel engine powered, pneumatic tyred Motor Grader of 270HP – 290HP. (**201.34 KW – 216.25 KW).**

2. References:

The following International Standards are referred to in, and form part of, the Specification. The superseded or equivalent standards, if any, to any of the following ISO standards if offered are to be supported by documentary evidence in form of copies of the equivalent standards certifying that offered standards are identical to the corresponding ISO standards of NIT.

ISO 2867	Earth-moving machinery - Access systems
ISO 3449	Earth-moving machinery - Falling-object protective structures – Laboratory tests and performance requirements
ISO 3450 -	Earth-moving machinery - Braking System of rubber-tyred machines - System and performance requirements and test procedures
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications
ISO 3471	Earth-moving machinery - Roll-over protective structures - Laboratory tests and performance requirements
ISO 5010	Earth-moving machinery - Rubber tyred machines- Steering requirements
ISO 6014	Earth-moving machinery - Determination of ground speed
ISO 6405-1	Earth-moving machinery - Symbols for operator controls and other displays - Part 1: Common symbols
ISO 6405-2	Earth-moving machinery - Symbols for operator controls and other displays - Part 2: Specific symbols for machines, equipment and accessories
ISO 6682	Earth moving machinery - Zones of comfort and reach for controls ISO 6750 Earth-moving machinery - Operation and maintenance - Format and content of manuals
ISO 7129	Earth-moving machinery - Tractors with dozer, graders, tractor scrapers - Cutting edges - Principal shapes and basic dimensions
ISO 7457	Earth-moving machinery - Determination of turning dimensions of wheeled machines Earth-moving machinery - Determination of turning dimensions of wheeled machines

ISO 7464 Earth-moving machinery - Method of test for the measurement of drawbar pull
ISO 9249 Earth-moving machinery - Engine test code - Net power
ISO 10570 Earth-moving machinery - Articulated frame lock - Performance requirements
ISO 10968 Earth moving machinery - Operator's controls
ISO 5006 Earth-moving machinery -- Operator's field of view -- Test method and performance criteria

3. Design Criteria:

The Motor Grader shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in hard, highly abrasive, blasted sandstone/rock having a density after blasting of 1,800 kg/m3.
The Motor Grader will be used for construction/maintenance of haul roads in open cast projects and for other maintenance jobs at open cast mines of _____ (name of subsidiary). The Motor Grader shall have the following working ranges:

a. Blade length- equal or more than 4800mm
b. Blade Height- equal or more than 680mm
c. Blade thickness- equal or more than 25mm
d. Blade Lift above ground - equal or more than 400mm
e. Shoulder Reach, (left side)- equal or more than 2150mm
f. Shoulder Reach, (right side)- equal or more than 2150mm
g. Turning Radius, Outside Front Tyres- equal or less than 8150mm

4. Technical Requirements:

4.1 *Engine:*

The Motor Grader shall be powered by a direct injection 4 -stroke turbo-charged diesel engine of 270HP – 290 HP (201.34 KW – 216.25 KW) measured between 1700 and 2200 r/min according to ISO 9249.

The engine shall be provided with 24V electrical starting, dry type 2 stage air cleaner with dust evacuator, dust level indicator and 2 stage fuel filter with water separator.

The engine shall have a water jacket cooling system, thermo-statically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy- duty radiator. The system shall be capable of providing sufficient cooling to allow the dumper to continuously operate at full rated output at the maximum ambient temperature. The radiator cap shall be fastened with body with the help of suitable capacity chain/locking arrangement.

The moving parts of the engine shall be lubricated by an engine driven oil pump with full flow oil filtration and cooling.

The engine shall be provided with a heavy-duty pan guard / suitable protection as per manufacturer design.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with minimum EPA Tier I or above or equivalent standard certified. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of tendering. Certificate for EPA Tier I or above or equivalent from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet upto 3 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

4.2 ***Transmission:***

Hydra shift / automatic transmission consisting of planetary gear drives and hydraulically operated multiple disc type clutches equipped with suitable valves for developing minimum 6 forward and 6 reverse speeds. Suitable gear shifting locking device to prevent accidental machine start should be provided.
Suitable protection of the transmission pan from external damage should be provided. The pan guard should be designed to minimize accumulation of dirt and debris.

In the case of any other alternative type of Transmission, the system must be clearly defined and illustrated

4.3 ***Final Drive:***

Suitable Final Drive of proven design should be provided. Final Drive such provided must be clearly illustrated

4.4 ***Steering:***

Full hydraulic orbitrol power steering system shall be provided. Minimum Frame articulation angle of 15 degree left and right should be there.

4.5 ***Hoses:***

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire resistant /retarder hydraulic hoses in place of ordinary hoses to decrease the chance fire. All hoses and piping shall be protected from damage.

4.6 ***Brakes***

The service brakes shall be foot operated, air/hydraulically actuated, oil disc brakes and of proven design. They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.
The Parking Brake shall be Spring applied, air or hydraulically released, dry disc type/ oil disc type / Calliper Type.

4.7 Tyre

Tubeless, rock duty, cut-resistant tyres of suitable size shall be provided

4.8 ***Frame :***

An articulated frame with a locking device which complies with ISO 10570 shall be provided

4.9 Grader Attachment*:*

4.9.1 Blade Circle

The blade circle should be an internal gear type of adequate diameter with uniform heat treated teeth. Top & bottom raised wear surfaces will be provided to prevent the circle teeth from contacting the support shoes. The blade circle shall be hyd. Controlled to provide full 360 degree rotations in either direction and fitted with a mechanical lock operated from the operator's cab.

4.9.2 Mould Board

The mould board shall be heavy duty reinforced construction with wear resistant steel & replaceable & reversible end bits and side edges. Heavy duty hardened steel wear resistant cutting edges, which comply with ISO :7129 shall be provided. Blade side shift and tip control should be by means of hydraulic cylinders.

4.10 Hydraulic System

All machine controls shall be hydraulically operated. The Motor Grader hydraulic system should be of proven design for efficient operation. The

hydraulic pumps, motors and cylinders should be field proven large heavy duty type and have suitable in-built protection from surge, cavitation, loss of oil due to hose leakage or burst, etc. As far as practicable reputable single make pumps, motors, cylinders and valves, etc. shall be used in the machine.
Adequate filtration of hydraulic oil shall be provided.

4.11 Fuel Tank

The fuel tank shall be of sufficient capacity to allow 16 hours operation without re- fueling and be provided with a level indicator and a lockable hinged filler cap. Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.12 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

4.12.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration- suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

4.12.2 Operator's Protective Structures:

Grader shall be equipped with FOPS as per ISO –ISO3449 & ROPS as per ISO 3471/ ISO 12117-2

4.12.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

4.12.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self- acting or shall act by compulsory actuation of the relevant device.

4.12.5 Starting and Stopping System:

Grader shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

4.13 Machinery House

The Motor Grader shall be provided with a dust proof machinery house/suitable arrangement made of steel sheet supported by a steel structure and shall cover the engine & drive system. It shall be designed to give ready and safe access to personnel & equipment for maintenance.

In case non-slip type walkways and catwalks with handrails shall be provided in and around the machinery house, the operator's cab and service platforms that shall comply with International Standards

4.14 Gauges and Indicators

The following shall be provided:

a) Water temperature gauge
b) Engine oil pressure gauge/ indicator
c) Air Pressure Gauge
d) Fuel capacity gauge.
e) Engine tachometer
f) Engine hour-meter

In case any of these gauge(s) is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

4.15 Warning Alarms/Lights

The following audio/visual warning alarms shall be provided:

a) Coolant level & temperature
b) Engine oil pressure
c) Converter oil temperature (where applicable)
d) Reversing alarm. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the vehicle.
e) Brake Indicator light

4.16 Electrical Equipment

The grader shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make.
b) 24 V Electrical starter motor of reputable make
c) Reputable make high capacity maintenance free batteries
d) Battery isolation switch

All Electrical wires & sleeves are to be of fire resistant quality to decrease chance of fire.

Electrical wires are to be passed through flexible metallic conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses, which shall be easily accessible for maintenance.

4.17 Lighting

Adequate LED lighting and illumination at strategic points both outside and inside of the machine shall be provided for visual observation and night shift operation. Details to be provided.

4.18 Guards and Shields

Adequate guards and shields, which comply with International Standards shall be provided throughout the Motor Grader.

4.19 Fire Extinguisher

A fire extinguisher shall be provided on the dozer, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS:15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Fire Extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS(Approval)CircularNo.02 dtd. 08thJuly2013.

Periodical refilling of fire extinguisher to be done by the supplier within the contract period.

4.20 Fire Detection and Suppression System*:*

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the dumper.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for

AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

4.21 Safety Requirements

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment

The following safety features shall be provided in the equipment

a. All function cut off switch
b. Roll over protection.
c. Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
d. Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
e. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
f. Warning System for Operator Fatigue - Should comply as per requirement of Clause- 2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
g. Mirrors, right and left
h. Hot zones shall be separated from cold zone by providing baffle plate.
i. Exhaust pipes and turbocharger shall be adequately guarded.
j. Vent valve on top of Hydraulic Tank should be able to be removed without any tool.
k. Blind spot mirror
l. Suitable auto dipping system.
m. Suitable protection guard / device for windscreen / windshield of Operator's cabin.
n. Retro Reflective Reflectors on all sides for visibility of grader during night

5 Special Guarantees

The following guarantee will apply for the different components from the date of commissioning:

i. Body chassis& differential – 36 months or 10,000 hours (Whichever is earlier)
ii. Complete engine system – 24 months or 6000 hours (whichever is earlier).
iii. Transmission Assy. – 24 months or 6000 hrs (whichever is earlier)
iv. Disc Brake – 24 months or 6000 hours (whichever is earlier)

In case of failure of any of the above component within the special guarantee

period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of above assemblies after attaining above mentioned special guarantee period as indicated against individual item.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of the subsidiary company shall be final and binding for both supplier and purchaser

6 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are **3000 (Three thousand)** hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (Eighty five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for balance period of the contract.

[[Note - Expected annual working hours and guaranteed availability may be decided by subsidiary company as per actual requirement]

7. Health monitoring system:

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

a) Working hour,
b) Engine oil pressure & temperature
c) Coolant temperature
d) Coolant level
e) Engine RPM
f) Fuel level and fuel consumption rate

g) Transmission Oil temperature
h) Hyd. oil temperature
i) Hyd. Oil Level in the tank
j) Engine electrical system - Battery voltage and Alternator out put

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

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The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
2. The real time interface telemetry port will be provided in the equipment
3. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
4. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
5. There shall be integrated on board data management system as explained at point no.3 as above.
6. Permission to third party for interfacing, data collection through online port.
7. Signing of Non-disclosure agreement to protect intellectual property right on either side.
8. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
9. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

8 Expected life of major assemblies:

Manufacturer shall give expected life of major assemblies also in the Format given in Table below, duly signed.

Table

EQUIPMENT	MAJOR ASSEMBLIES	EXPECTED LIFE* (in Hours)
Motor Grader	Main Frame	
	Engine	
	Transmission/Torque Convertor	
	Electrical system	
	Blade Circle	
	Mould Board	

Note - * Expected life means life before first overhaul

9 Information to be provided by the supplier:

The supplier shall furnish the following information.

9.1 General:

i. Number of similar model supplied during the last **5 (Five)** years. The information shall be given in the following format and in the order of most recent first.

Company Name	Mine Name	Mine Location	Mine type	Sl No. of Machines	Model & Capacity	Commissioned date (DD/MM/YYYY)

The information in the above format should be self certified.

ii. Details of nearest Depot/Warehouse and Service Facility available for the present offer
iii. Details of special tools to be provided with the equipment.
iv. Details of maintenance schedule.
v. Details of erection programmes for the bid.

9.2 Technical Details:

a) Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO 9249.
b) Maximum travel speed determined according to ISO 6014.
c) Drawbar pulls at 1km/h and zero speed measured according to ISO 7464.
d) Detailed technical descriptions of the motor grader
e) Comprehensive commercial literature specifications, the content of which must comply with ISO 6747.
f) Details of major bought-out assemblies and sub-assemblies including manufacturer, types, etc.
g) Detailed list of instrumentation, monitoring and alarm system
h) Layout drawings and detailed descriptions of all hydraulic systems and components.
i) Details & layout of automatic fire detection and suppression system

9.3 Dimensions, Weight and Performance Details: (All in SI unit wherever applicable)

9.3.1 **Dimensions**

a) Maximum overall length,
b) Maximum overall width,
c) Maximum overall height
d) Drawbar height

9.3.2 **Working Ranges**

a) Maximum Lift above ground
b) Maximum Drop below ground
c) Blade tip range, Forward & Backward
d) Maximum shoulder reach
   i) Left
   ii) Right

9.3.3 **Weights**

a) Shipping Weight of individual components.
b) Total operating weight

9.3.4 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque at….r/min

9.3.5 **Transmission**

a) Make and Model
b) Type
c) Number of gear speeds, forward and reverse
d) Travel speeds, forward and reverse

9.3.6 **Final Drive**

a) Make
b) Type
c) Ratio

9.3.7 **Brakes**

9.3.7.1 **Service Brake**

a) Type
b) Actuating system

9.3.7.2 **Parking Brake**

a) Type
b) Actuating system

9.3.8 Tyres

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

9.3.9 Steering System

a) Type & Make
b) Articulation Angle
c) Total Steering Angle
d) Turning Radius
e) Emergency Steering method (if provided)

9.3.10 Hydraulic System

a) Make, number, flow rates and operating pressures of pumps
b) Make, number and ratings of motors (where applicable)
c) Make, number, piston diameters and stroke lengths of cylinders
d) Relief valve operating pressures

9.3.11 Mould board

a) Length
b) Height
c) Thickness

9.3.12 Circle

b) Circle Diameter (outer)

9.3.13 Front Axle

a) Type & Make
b) Ground Clearance
c) Oscillation Angle
d) Front Wheel Leaning

9.3.14 Electrical Systems

a) Starter make and model
b) Alternator make and model
c) Batteries, numbers and rating
d) Lighting details

TYRE HANDLER

(Tyre-Handler of capacity not less than 8000 kg)

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF TYRE HANDLER (Capable of Handling Tyre size of 18.00X25 to 40.00X57.00)

.1 **Scope of Specification:**

This specification is intended to cover the technical requirement for the design, manufacture, testing, delivery, on site erection and commissioning of a diesel powered, self–propelled Earthmover Tyre-Handler of capacity not less than 8000 kg

.2 **Design Criteria**

The Tyre Handler shall be capable of operating for protracted periods on a system of 2 shifts each of 8 hours duration per day throughout the year. The Tyre Handler shall consist of rough terrain front End wheel Loader / Fork Lift Truck carrier vehicle, with attachment suitable for handling mining earthmover tyres (fitted in the 35T-240T Class of Dumpers) with the minimum lift capacity of 8000 Kg so that it has sufficient reserve lifting capacity and can operate directly at the mines face.

Tyre handler shall be capable of handling the assembled tyre during changing the tyre assembly in workshop and holding & carrying the inflated Tyre assembly to the coal mine area, which normally have rough terrain, for change of tyre on the equipment gone under break down during operation on account of OTR tyre.

The Tyre handler shall have suitable attachment for handling earth mover tyres (size in the range of 18.00X 25 up to 40.00X57) fitted in the 35T-240T Class Dumpers. The capacity of the equipment shall match with the requirement of tyre handling i.e., lifting & carrying to the site with maximum weight of assembled tyre.

The tyre handler shall have the following minimum working ranges.	Unit	Nature of Requirement	Required Value
a. Lifting Capacity of Tyre Handler	KGS	EQUAL or MORE than	8000
b. Minimum Clamping span	mm	EQUAL or LESS than	1450
c. Maximum Clamping span	mm	EQUAL or MORE than	4000
d. Lift	mm	EQUAL or MORE than	4500
e. Gradeability	%	EQUAL or MORE than	25

f. Lateral side shift (in either side)	mm	EQUAL or MORE than	200
g. Body rotation	Degree	EQUAL or MORE than	330
h. Clamping pad rotation - (Continuous)	Degree	EQUAL TO	360
i.Forward reach of equipment from the edge of front tyre and centre of clamp pad of tyre handler.	mm	EQUAL or MORE than	3000

The Tyre Handler Carrier Vehicle should be either rough terrain front end loader or rough terrain fork lift having sufficient ground clearance so that it can work in workshop and also in coal mine area

.3 **References**:

The International Standards referred in the following clauses, should form part of the Specification:

4 **Technical Requirement**

4.1 **Engine**

The tyre handler shall be powered by a direct injection 4 stroke diesel engine with a continuous output rating compatible with the tyre handling requirement. The engine shall be provided with 24V electric starting, dry type 2 stage air cleaner and fuel fi lter with water separator. The engine shall have a water jacket cooling system, thermostatically controlled using an engine driven water pump, with cooling water re- circulated through a heavy duty radiator. The system shall be capable of providing sufficient cooling to allow the tyre handler to operate continuously at the full rated output and at the maximum ambient temperature.

The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling.

The engine is to be environmentally certified with minimum EPA Tier I or above or latest as per applicable emission norms of notifications of Govt. of India at the time of tendering.

4.2 **Transmission**

The tyre handler shall be provided with a full power shift hydraulic transmission and suitable torque converter. The transmission shall be preferably provided with a heavy- duty guard designed to protect transmission & minimize the accumulation of dirt and debris on the bottom of transmission assembly.

4.3 Differential & Final Drives-

Traction-sensing or other suitable type differential with spiral bevel gears, heavy duty axles and planetary gear final reductions shall be provided.

4.4 Steering

Full power Hydraulic steering shall be provided.

4.5 Hydraulic

Tyre handling shall be controlled by a suitable hydraulic valve controlled from the operator's cab. Locking valves should be provided in the clamp circuit to ensure safe and positive clamping.

4.6 **Tyre handling attachment**

The head assembly and clamping pads should be provided with spur gear driven, 330 degree continuous rotation for ease of maneuverability and tyre fitting. Lateral side shifting of minimum 200 mm on either side should be provided to allow the precise alignment of tyre during tyre mounting. Contact pads should be designed to grip a wide range of tyre profiles as per size range specified.

The clamping force of the tyre handler shall be independent of clamping span and suitable to match with the requirement.

4.7 **Brakes**

4.7.1 **Service brakes**

Suitable reliable multiple disc service & Secondary brake shall be provided.

The front & rear service brake should be air and/or oil actuated fully enclosed type to prevent entry of dust and water and be designed for low maintenance.

4.7.2 **Parking brakes**

Suitable reliable fail-safe Parking Brake shall be provided.

.4.8 **Hoses**

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire resistant hoses are to be provided in hot zone areas.

4.9 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.10 **Fuel Tank**

The fuel tank shall be of sufficient capacity to allow 16 hours operation without re- fueling and be provided with a level indicator and lockable-filler cap. Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel.

4.11 **Lubrication System**

A centralized automatic lubrication system of positive pressure type shall be provided with warning alarms for identification of failed points. It shall consist of pneumatically/ hydraulically / electrically operated pumps, which deliver lubricant through a single supply-line to the injectors at required interval and in required quantities.

The lubrication system shall be rated for continuous operation with on-off timers. The Centralized Automatic Lubrication System shall be provided with warning alarms for identification of failed parts. The centralized lubrication shall cover all the points including the tyre handler attachment greasing points.

4.12 **Operator's Cab**

A fully insulated, Air conditioned, sound suppressed, lockable operator's cab with fully adjustable suspension seat, safety glass, windshield wipers and washers and cooling fan shall be provided.All doors, windows and vents of cabin shall have dust and weather proof seals

ROPS which comply with ISO 3471 OR Latest shall be provided FOPS which comply with ISO 3449 OR Latest shall be provided.
All operating controls, monitoring & working signals shall be conveniently located in console within easy reach of the operator and shall comply with ISO 6405-1 & ISO 6405-2.Steps walk ways and hand rails which comply with ISO 2867 shall be provided for access to operator's cab and service point

Operator cabin should be designed in such a way so as to have clear visibility to operator for safe operation of equipment and also to avoid need of additional person to guide the operator during tyre handling operation.

4.13 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished

4.14 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the tyre handler.
d) High torque converter oil temperature

4.15 **Electrical Equipment**

The tyre handler shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch

Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance. At least two spare fuses of each size shall be provided in each fuse box in case fuse are provided.

4.16 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable

4.17 **Guards and Shields**

Adequate guards and shields, which comply with ISO: 3457 shall be provided on the Tyre Handler

.4.18 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Tyre Handler, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian

Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08th July2013**.

4.19 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ along with each tyre handler

i. Towing hook.
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered necessary& essential for satisfactory working of tyre handler, should be included in the offer.
viii. 1 no. extra tyre (to be used exclusively in case of failure on user account)

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components.

i) Complete Engine system- 36 months or 6000 hours from the date of commissioning (whichever is earlier).
ii) Transmission Assy. - 36 months or 6000 hrs from the date of commissioning (whichever is earlier).
iii) Frame, Chassis, Differential & Final Drive- 48 months or 8000 hrs from the date of commissioning (whichever is earlier)
iv) Hydraulic Pump & Control valve - 36 months or 6000 hours from the date of commissioning (whichever is earlier)
v) Auto Electricals - 12 months or 3000 hrs from the date of commissioning (Whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement
/ rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of

subsidiary shall be final and binding for both supplier and purchaser

6 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than
85% (Eighty- Five Percent) for a period of 12 months from the date of commissioning.

7 Information To Be Provided By The Supplier

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 General

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.
Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.

d) Details of erection programmes for the bid.

e) Details of maintenance schedule.

7.2 Technical Details

a. Latest engine performance curves showing net power, net torque andspecific fuel consumption of the installed engine, measured according to ISO9249.
b. Maximum travel speed determined according to ISO 6014.:
c. Turning diameter according ISO 7457.
d. Detailed technical descriptions of the tyre handler.
e. Layout drawings and detailed descriptions of all hydraulic systems and components.
f. Details of Comprehensive commercial literature specifications, the content of which must comply with ISO 7131.
g. Detailed list of instrumentation, monitoring and alarm systems.
h. Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
i. Operation and maintenance manuals in accordance with ISO 6750
j. Details of Auto Lubrication System. Make of the system to be indicated.

7.3 **Dimensions, Weights and Performance Details (All** in SI unit wherever applicable)

7.3.1 **Dimensions**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Loading height
e) Wheel base

7.3.2 **Weights**

a) Handling attachment weight
b) Operating weight - front wheels
c) Operating weight - rear wheels
d) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Minimum turning radius (over tyres)
c) Steering angle (each direction)

7.3.6 **Brakes**

7.3.6.1 Service brakes

7.3.6.2 **Front**

a) Type
b) Actuating system

7.3.6.3 **Rear**

a) Type
b) Actuating system

7.3.6.4 **Parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries - numbers and rating (ZeroMaintenance Battery Required i.e., completely sealed and no top up required)
d) Lighting details

7.3.10 **Clamping Arm**

a) Capacity (Minimum and Maximum Tyre size)
b) Maximum Lift Capacity (Kg)
c) Body Rotation (Degrees)
d) Clamping Span (MM)
e) Side shifting (MM)
f) Lifting Height (MM)

7.3.11 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

TYRE HANDLER

(Tyre Handler capacity of 3500 kg)

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF TYRE HANDLER (Capable of Handling Tyre size of 18.00X25 to 33.00x51.00)

1 **Scope of Specification:**

This specification is intended to cover the technical requirement for the design, manufacture, testing, delivery, on site erection and commissioning of a diesel powered, self–propelled Earthmover Tyre-Handler of capacity not less than 3500 kg

2 **Reference**

The International Standards referred in the following clauses, should form part of the Specification:

3 **Design Criteria**

The tyre handler shall be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.
The handler shall be capable for changing the tyre assembly in workshop and holding & carrying the inflated tyre assembly to the coal mine area, which normally have rough terrain, for change of tyre on the equipment gone under breakdown during operation on account of OTR Tyre. It shall also facilitate removal and installation of inner tyre of the dual tyres fitted in respective earth movers.

The tyre handler shall have suitable attachment for handling earth mover tyres size ranging from 18.00 x 25 to 33.00 x 51 with rim including wide base tyres such as 23.50x25, 21.00 x 25, 29.50 x 29 etc. The capacity of equipment shall match with the requirement of tyre handling i.e., lifting and carrying to the site with max weight of assembled tyre (about 3500 kgs).

The tyre handler shall have the following minimum working ranges

a. Clamping span - 1450 mm to 3350 mm
b. Lift height - Minimum 3200 mm

4 **Technical Requirement**

4.1 **Engine**

The tyre handler shall be powered by a direct injection 4 stroke diesel engine with a continuous output rating compatible with the tyre handling requirement. The engine shall be provided with 24V electric starting, dry type 2 stage air cleaner and fuel filter with water separator. The engine shall have a water jacket cooling system, thermostatically controlled using an engine driven water pump, and with cooling water re-circulated through a heavy duty radiator. The system shall be capable of providing sufficient cooling to allow the tyre handler to operate continuously at the full rated

output and at the maximum ambient temperature.

The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling.

The engine is to be environmentally certified with minimum EPA Tier II or above or latest as per applicable emission norms of notifications of Govt. of India at the time of tendering.

4.3 Transmission

The tyre handler shall be provided with a full power shift hydraulic transmission and suitable torque converter. The transmission shall be preferably provided with a heavy duty guard designed to protect transmission & minimize the accumulation of dirt and debris on the bottom of transmission assembly.

4.4 Differential & Final Drives-

Suitable all-wheel drive differential and final drive shall be provided to meet the requirement of operating parameters given in the design criteria.

4.4 Steering

Articulated, Full power Hydraulic steering shall be provided.

4.5 Hydraulic

i. For Steering, Lift & Dump – Suitable capacity pumps for steering, lift & dump and control valve double spool type having positions for Lift system- Raise, Hold, Lower and Float and dump system – Roll Back, Hold & Dump. Lift & dump action shall be through suitable capacity double acting hydraulic cylinders.

ii. For Tyre Handler – Tyre handler shall be provided with suitable pump and hydraulic control valve having controlled from the operator's Cab. Clamping circuit should be independently controlled with provision of locking valve to ensure safe and positive clamping.

4.6 Tyre handling attachment

The head assembly should have minimum 90 deg rotation and clamping pads 360deg continuous rotation. Lateral side shifting of 100mm minimum either side should be provided to allow precise alignment during tyre mounting.The contact pads shall be designed to grip a wide range of tyre tread profiles within the size range specified.
The clamping force of tyre handler shall be independent of clamping span and suitable to match with the requirement.

4.7 Brakes

Suitable reliable service and fail safe parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be air and / or oil actuated wet multiple disc brake for both Front and Rear.

They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance

.4.7.2 **Parking brakes**

The parking brakes should be Caliper/Disc Type Brakes.

4.8 **Hoses**

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire resistant/Retardant hoses are to be provided in hot zone areas.

4.9 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.10 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.11 **Operator's Cab**

An operator's canopy with fully adjustable suspension seat and a cooling fan shall be provided.
All operating controls, monitoring and working signals should be conveniently located in consoles within easy reach of the operator and shall comply with ISO6405-1 and ISO 6405-2.
Steps, walkways and handrails which comply with ISO 2867 shall be provided for access to the operator's cab and service points

4.12 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.13 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the tyre handler.
d) High torque converter oil temperature

4.14 **Electrical Equipment**

The tyre handler shall be provided with the following:

a) 24V DC electrical system with suitably rated alternator of reputable make
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch

Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance. At least two spare fuses of each size shall be provided in each fuse box in case fuse are provided.

4.15 Lighting

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable

4.16 **Guards and Shields**

Adequate guards and shields, which comply with ISO: 3457 shall be provided throughout the excavator.

4.17 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Tyre Handler, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other

documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) CircularNo.02 dtd. 08thJuly2013**.

4.18 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ along with each tyre handler

i. Towing hook.
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory working of tyre handler, should be included in the offer.

5 Special Guarantee - Warranty Clause

The following guarantee will apply for the different components: -
i) Complete Engine system- 36 months or 6500 hours from the date of commissioning
(Whichever is earlier).
ii) Transmission Assy. - 36 months or 6500 hrs from the date of commissioning (whichever is earlier).
iii) Frame, Chassis, Differential & Final Drive- 48 months or 8000 hrs from the date of
Commissioning (whichever is earlier)
iv) Hydraulic Pump & Control valve - 36 months or 6500 hours from the date of commissioning (whichever is earlier)
v) Auto Electricals - 12 months or 3000 hrs from the date of commissioning (Whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

6 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by

subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than
85% (Eighty- Five Percent) for a period of 12 months from the date of commissioning.

7 Information To Be Provided By The Supplier

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 General

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm.Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.
Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.

d) Details of erection programmes for the bid.

e) Details of maintenance schedule.

7.2 Technical Details

a. Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO9249.
b. Maximum travel speed determined according to ISO 6014.:
c. Turning diameter according ISO 7457.
d. Detailed technical descriptions of the tyre handler.
e. Layout drawings and detailed descriptions of all hydraulic systems and components.
f. Details of Comprehensive commercial literature specifications, the content of which must comply with ISO 7131.
g. Detailed list of instrumentation, monitoring and alarm systems.
h. Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
i. Operation and maintenance manuals in accordance with ISO 6750

7.3 Dimensions, Weights and Performance Details (All in SI unit wherever applicable)

7.3.1 Dimensions

a) Maximum overall length
b) Maximum overall width

c) Maximum height
d) Loading height
e) Wheel base

7.3.2 **Weights**

a) Handling attachment weight
b) Operating weight - front wheels
c) Operating weight - rear wheels
d) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Minimum turning radius (over tyres)
c) Steering angle (each direction)

7.3.6 **Brakes**

7.3.6.1 Service brakes

7.3.6.2 **Front**

a) Type
b) Actuating system

7.3.6.3 **Rear**

a) Type
b) Actuating system

7.3.6.4 **Parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Starter control make and model
c) Alternator make and model
d) Batteries - numbers and rating
e) Lighting details

7.3.10 **Clamping Arm**

a) Capacity (Minimum and Maximum Tyre size)
b) Maximum Lift Capacity (Kg)
c) Body Rotation (Degrees)
d) Clamping Span (MM)
e) Side shifting (MM)
f) Lifting Height (MM)

7.3.11 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

CRANE

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF 75 TONNE CAPACITY ROUGH TERRAIN MOBILE CRANE

1 **Scope of Specification:**

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 75Tonne capacity hydraulic rough terrain Mobile Crane.

2 **Reference**

The following International Standards are referred to in, and form part of, the Specification:

ISO 4305:	Mobile cranes - Determination of stability
ISO 7363:	Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1:	Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2:	Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625:	Cranes – Selection of wire ropes, drums and sheaves

IS 4573-2020 (with latest applicable revision) : Specification for power drive Mobile Cranes / plus

Any other ISO specifications, as applicable

3 **Design Criteria**

The Crane shall be designed for heavy duty application in the extreme mining The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The Crane should have a lifting capacity, with outriggers, of not less than 75tonne at a radius of 3 m, 360 degree Slew, and a basic boom length of not less than 10 m. The fully extended boom length should be not less than 30 m.

The lifting capacity shall be in accordance with American Standard CS 90 -58 and should not exceed 85% of the tipping load in accordance with ISO 4305.

The Crane shall have a gradeability of not less than 40% and should be capable of 360-degree rotation with rated loads.

The crane should be capable of lowering the rated loads a minimum of 4m below ground level and should have adequate pick up and carry capacity of not less than 15 MT at 6m radius over the front. Ground clearance shall be sufficient for smooth operation both in mines and workshop premises

4 **Technical Requirement**

4.1 **Engine**

The Crane shall be powered by a direct injection 4-stroke, diesel Engine of suitable HP. The Engine shall be provided with 12V/24V electric starting, dry type 2 - stage air-cleaner with automatic dust evacuator and dust level indicator and 2-stage fuel filter with water separator.

The Engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty Radiator. The system shall be capable of providing sufficient cooling to allow the crane to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the Engine shall be lubricated by an Engine driven oil pump, with full flow oil filtration and cooling.

The Engine shall be equipped with an over-speed governor or a suitable system for governing the speed.

The engine is to be environmentally certified for minimum CEV Stage III and complying applicable notifications of the Govt. of India at the time of tendering. The Engine electronic control module should be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

4.2 Transmission

The Crane shall be provided with an off-highway power shift hydraulic/ hydrodynamic full power shift torque converter- Transmission having a sufficient number of speeds to enable it to travel in rugged mining conditions.

Suitable protection of the Transmission pan from external damage should be provided. The pan guard should be provided which should be designed to minimize accumulation of dirt and debris.

4.3 Differential & Final Drives-

Suitable 4 x 4 - wheel drive-steer with provision for 4 x 2-wheel drive-steer, with suitable Differential and planetary reduction hubs (if applicable) shall be provided.

4.4 Steering

Full hydraulic/ hydrostatic power steering shall be provided, which should have the capability of normalizing steering control when the machine is slewed to the rear of the chassis.

4.5 **Hoses**

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas.

4.6 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.7 **Brakes**

Suitable reliable fail-safe service and parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be suitable disc brake for both Front and Rear.
The service brakes shall be air and/or oil actuated multiple disc type and should operate automatically in the event of low air/oil pressure.
They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.

4.7.2 **Parking brakes**

The parking brakes should be Caliper / Disc Brakes.

4.8 Frame

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration, with integral outrigger housings. The design must take care of all forces encountered during the operation of the Crane.

4.9 **Outriggers**

An adequate number of hydraulically operated outriggers with horizontal beams and vertical jacks, fitted with integral check- valves/ holding valves on each extension cylinder. The operation of outriggers/ Jacks shall be controlled from the operator's cab and suitable Level Indicator should be provided inside the operator's Cab, within the easy reach of the operator.

4.10 **Boom**

The boom shall be provided with multi-section, full power hydraulic/ power-pinned telescoping sections. Basic length should be not less than 10 meter and extending up to not less than 30 meter.
Dual boom hoist cylinder shall be provided for safe boom elevation to entire range.

4.11 **Lifting Block**

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

4.12 **Hoist System**

A suitable single/ multiple speed hoist system shall be provided with a counter- balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity,
shall be provided.

4.13 **Safe Load Indicator**

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and over hoist.
Digital indication of net/ gross load, maximum permissible load, boom inclination, boom length, radius, shall also be provided.

4.14 **Derricking and Slewing**

High-speed derricking and slewing motions with sensitive fail-safe controls / brakes shall be provided.
Machine should be capable for Full 360 degree continuous rotations.

.4.15 **Drums and sheaves**

The drums and sheaves used for hoisting shall be in accordance with ISO 16625.

4.16 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.17 **Operator's Cab**

A fully insulated, sound suppressed, air-conditioned operator's cab with tinted safety glass having adequate window area to provide full vision in all directions. A rear- view mirror, windshield wipers and washers, a fully adjustable operator's seat, floor mat and a cooling fan shall be provided.
All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.
Steps and handrails shall be provided for access to the operator's cab. FOPS shall be provided as per ISO – ISO3449

4.18 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.19 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm whilereversing the equipment should have a flasher/blinker at the rear end of the Crane.
d) High torque converter oil temperature

e) Low air pressure (if applicable)

4.20 **Electrical Equipment**

The Crane shall be provided with the following:

a) 12V/24VDC electrical system with suitably rated alternator of reputable Make.
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch
e) Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance.

4.21 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

e) Front and Rear lights
f) Stop and tail lights
g) Instrument panel and cab light
h) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable
f) Front and rear turn indicators

4.22 **Guards and Shields**

Adequate guards and shields, shall be provided throughout the Crane

4.23 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08thJuly2013**.

4.24 **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Crane.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

4.25 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ along with each Crane

i. Front and rear tow hooks and two lifting loops
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory& safe working of Crane,

should be included in the offer.

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components:-

a. Complete Engine System: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b. Transmission Assembly: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

c) Frame, Chassis, Differential & Final Drive- -48 months or 8000 hrs. from the date of commissioning (whichever is earlier)

d) Hydraulic Pumps & Control valves -36 months or 6000 hours from the date of commissioning (whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary company shall be final and binding for both supplier and purchaser

6 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than

85% (Eighty- Five Percent) for a period of 12 months from the date of commissioning.

7 **Information to be Provided by the Supplier**

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 **General**

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm.Date

b) Details of nearest Depot/Warehouse and Service Facility available

for the present offer, to be furnished in the following format. Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.
d) Details of erection programmes for the bid.
e) Details of maintenance schedule.

7.2 **Technical Details**

a) Latest engine performance curves showing net power, net torque andspecific fuel consumption of the installed engine,
b) Maximum travel speed
c) Turning diameter
d) Detailed technical descriptions of the Crane.
e) Layout drawings and detailed descriptions of all hydraulic systems and
f) Components.
g) Details of Comprehensive commercial literature specifications.
h) Detailed list of instrumentation, monitoring and alarm systems.
i) Details of major bought-out assemblies and sub-assemblies including
j) Manufacturer, type, etc.
k) Lifting capacity range diagrams and tables.
l) Details of safe load indicator.
m) Details of fire detection and suppression system

7.3 **Dimensions, Weights and Performance Details (**All in SI unit wherever applicable)

7.3.1 **Dimensions (in Retracted condition)**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

7.3.2 **Weights**

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Turning circle:
(i) All wheel steer
(ii) Front wheel steer
c) Clearance circle:
(i) All wheel steer
(ii) Front wheel steer

7.3.6 **Brakes**

7.3.6.1 **Service brakes**

7.3.6.1.1 **Front**

a) Type
b) Actuating system

7.3.6.1 .2 **Rear**

a) Type
b) Actuating system

.7.3.6.2 **Parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries - numbers and rating
d) Lighting details

7.3.10 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

7.3.11 **Derricking System**

a) Derricking System- Working details
b) Min. to max. radius in secs**.**

7.3.12 **Slew System**

a) Slew System - type & Working details
b) Slew Braking System
c) Slewing Speed (RPM)

7.3.13 **Hoist System**

a) Hoist System - type, Number of Speeds & Working details
b) Brake System - type & Working details
c) Speed Ranges of Hoist System

7.3.14 **Outriggers**

a) No of Outriggers
b) Horizontal stroke
c) Vertical stroke

7.3.15 **Boom**

a) Fully retracted length
c) Intermediate position length
d) Fully extended length

7.3.16 **Boom Telescoping**

a) Speed

7.3.17 **With Derrick down**

a) Overall length
b) Overall height
c) Overall width

7.3.18 **Dimensions**

a) Tail radius (m)
b) Wheel base (m)
c) Ground clearance (mm)
d) Angle of approach

7.3.19 **Rope**

a) Make
b) Dimension
c) Specification

7.3.20 **Lifting capacity**

a) Max Lifting capacity (for 360 degree slew) at 3 m radius
   (i) at clear out-reach 0 m
   (ii) at clear outreach 1 m
   (iii) at clear outreach 1.5 m
b) Max Lifting capacity (for 360 degree slew) at 4 m radius
c) On wheels (Stationary) :
   at 3 m radius
   at 4 m radius
   at 5 m radius
d) On wheels (Stationary):
   With clear outreach 0 m
   With clear outreach 1 m
   With clear outreach 1.5 m

e) Pick and carry capacity (at 4 km/h) :
   At 3 m radius
   At 4 m radius
   At 5 m radius
f) Lift of rated load at minimum radius in meters:
   (i) Below ground level
   (ii) Above ground level
g) Gradient unladen
h) Max. travel speed

7.3.21 **Operating speeds**

a) Hoist
b) Slewing RPM
c) Derricking
d) Travelling

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF 50 TONNE CAPACITY ROUGH TERRAIN MOBILE CRANE

1 **Scope of Specification:**

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 50 Tonne capacity hydraulic rough terrain Mobile Crane.

2 **Reference**

The following International Standards are referred to in, and form part of, the Specification:

ISO 4305 :	Mobile cranes - Determination of stability
ISO 7363 :	Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1 :	Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2 :	Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625 :	Cranes – Selection of wire ropes, drums and sheaves
IS 4573-2020 (with latest applicable revision):	Specification for power drive Mobile Cranes / plus
Any other	ISO specifications, as applicable

3 **Design Criteria**

The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The Crane should have a lifting capacity, with outriggers, of not less than 50 tonne at a radius of 3 m, 360 degree Slew, and a basic boom length of not less than 10 m. The fully extended boom length should be not less than 30 m.

The lifting capacity shall be in accordance with American Standard CS 90 -58 and should not exceed 85% of the tipping load in accordance with ISO 4305.
The Crane shall have a gradeability of not less than 40% and should be capable of 360 degree rotation with rated loads.

The crane should be capable of lowering the rated loads a minimum of 4m below ground level and should have adequate pick up and carry capacity of not less than 10MT at 6m radius over the front.
Ground clearance shall be sufficient for smooth operation both in mines and workshop premises

4 Technical Requirement

4.1 Engine

The Crane shall be powered by a direct injection 4-stroke, diesel Engine of suitable HP. The Engine shall be provided with 12V/24V electric starting, dry type 2 - stage air-cleaner with automatic dust evacuator and dust level indicator and 2 -stage fuel filter with water separator.
The Engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty Radiator. The system shall be capable of providing sufficient cooling to allow the crane to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the Engine shall be lubricated by an Engine driven oil pump, with full flow oil filtration and cooling.
The Engine shall be equipped with an over-speed governor or a suitable system for governing the speed.

The engine is to be environmentally certified for minimum CEV Stage III and complying applicable notifications of the Govt. of India at the time of tendering. The Engine electronic control module should be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

4.2 Transmission

The Crane shall be provided with an off-highway power shift hydraulic/ hydrodynamic full power shift torque converter- Transmission having a sufficient number of speeds to enable it to travel in rugged mining conditions.
Suitable protection of the Transmission pan from external damage should be provided. The pan guard should be provided which should be designed to minimize accumulation of dirt and debris.

4.3 Differential & Final Drives-

Suitable 4 x 4-wheel drive-steer with provision for 4 x 2-wheel drive-steer, with suitable Differential and planetary reduction hubs (if applicable) shall be provided.

4.4 Steering

Full hydraulic/ hydrostatic power steering shall be provided, which should have the capability of normalizing steering control when the machine is slewed to the rear of the chassis.

4.5 Hoses

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas

4.6 Tyres

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.7 Brakes

Suitable reliable fail safe service and parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be suitable disc brake for both Front and Rear.
The service brakes shall be air and/or oil actuated multiple disc type and should operate automatically in the event of low air/oil pressure.
They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.

4.7.2 **Parking brakes**

The parking brakes should be Caliper /Disc Type Brakes.

4.8 Frame

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration, with integral outrigger housings. The design must take care of all forces encountered during the operation of the Crane.

4.9 Outriggers

An adequate number of hydraulically operated outriggers with horizontal beams and vertical jacks, fitted with integral check- valves/ holding valves on each extension cylinder. The operation of outriggers/ Jacks shall be controlled from the operator's cab and suitable Level Indicator should be provided inside the operator's Cab, within the easy reach of the operator.

4.10 Boom

The boom shall be provided with multi-section, full power hydraulic/ power-pinned telescoping sections. Basic length should be not less than 10 meter and extending up to not less than 30 meter.

Dual boom hoist cylinder shall be provided for safe boom elevation to entire range.

4.11 Lifting Block

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

4.12 Hoist System

A suitable single/ multiple speed hoist system shall be provided with a counter- balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity, shall be provided.

4.13 Safe Load Indicator

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and over hoist.

Digital indication of net/ gross load, maximum permissible load, boom inclination, boom length, radius, shall also be provided.

4.14 Derricking and Slewing

High-speed derricking and slewing motions with sensitive fail-safe controls / brakes shall be provided.

Machine should be capable for Full 360 degree continuous rotations.

.4.15 **Drums and sheaves**

The drums and sheaves used for hoisting shall be in accordance with ISO 16625.

4.16 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.17 **Operator's Cab**

A fully insulated, sound suppressed, air-conditioned operator's cab with tinted safety glass having adequate window area to provide full vision in all

directions. A rear- view mirror, windshield wipers and washers, a fully adjustable operator's seat, floor mat and a cooling fan shall be provided.
All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.
Steps and handrails shall be provided for access to the operator's cab. FOPS shall be provided as per ISO – ISO3449

4.18 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.19 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the Crane.
d) High torque converter oil temperature
e) Low air pressure (if applicable)

4.20 **Electrical Equipment**

The Crane shall be provided with the following:

a) 12V/24VDC electrical system with suitably rated alternator of reputable Make.
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch
e) Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance.

4.21 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable
f) Front and rear turn indicators

4.22 **Guards and Shields**

Adequate guards and shields, shall be provided throughout the Crane

4.23 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) CircularNo.02 dtd. 08thJuly2013**.

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4.24 **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Crane.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed

to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.

- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

4.25 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ along with each Crane

i. Front and rear tow hooks and two lifting loops

ii. Horn.

iii. General Tool kit for repair and maintenance with list and quantity.

iv. Tyre inflation kit.

v. Rear View Mirror

vi. Operator seat belt

vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory & safe working of Crane, should be included in the offer.

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components:-

a. Complete Engine System: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b. Transmission Assembly: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b) Frame, Chassis, Differential & Final Drive- -48 months or 8000 hrs. from the date of commissioning (whichever is earlier)

c) Hydraulic Pumps & Control valves -36 months or 6000 hours from the date of commissioning (whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser. In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the

replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

6 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than
85% (Eighty- Five Percent) for a period of 12 months from the date of commissioning.

7 **Information to be Provided by the Supplier**

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 General

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.
Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.

d) Details of erection programmes for the bid.

e) Details of maintenance schedule.

7.2 Technical Details

a) Latest engine performance curves showing net power, net torque andspecific fuel consumption of the installed engine,

b) Maximum travel speed

c) Turning diameter

d) Detailed technical descriptions of the Crane.

e) Layout drawings and detailed descriptions of all hydraulic systems and components.

f) Details of Comprehensive commercial literature specifications.

g) Detailed list of instrumentation, monitoring and alarm systems.
h) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
i) Lifting capacity range diagrams and tables.
j) Details of safe load indicator.
k) Details of fire detection and suppression system

7.3 Dimensions, Weights and Performance Details (All in SI unit wherever applicable)

7.3.1 **Dimensions (in Retracted condition)**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

7.3.2 **Weights**

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Turning circle:
(i) All wheel steer
(ii) Front wheel steer
c) Clearance circle:
(i) All wheel steer
(ii) Front wheel steer

7.3.6 **Brakes**

7.3.6.1 **Service brakes**

7.3.6.1.1 **Front**

a) Type

b) Actuating system

7.3.6.1 .2 **Rear**

a) Type

b) Actuating system

.7.3.6.2 **Parking brake**

a) Type

b) Actuating system

7.3.7 **Tyres**

a) Make

b) Size and type

c) Tread

d) Ply rating

e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Starter control make and model
c) Alternator make and model
d) Batteries - numbers and rating
e) Lighting details

7.3.10 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

7.3.11 **Derricking System**

a) Derricking System- Working details
b) Min. to max. radius in secs**.**

7.3.12 **Slew System**

a) Slew System - type & Working details
b) Slew Braking System
c) Slewing Speed (RPM)

7.3.13 **Hoist System**

a) Hoist System - type, Number of Speeds & Working details
b) Brake System - type & Working details
c) Speed Ranges of Hoist System

7.3.14 **Outriggers**

a) No of Outriggers
b) Horizontal stroke
c) Vertical stroke

7.3.15 **Boom**

a) Fully retracted length
c) Intermediate position length
d) Fully extended length

7.3.16 **Boom Telescoping**

a) Speed

7.3.17 **With Derrick down**

a) Overall length
b) Overall height
c) Overall width

7.3.18 **Dimensions**

a) Tail radius (m)
b) Wheel base (m)
c) Ground clearance (mm)
d) Angle of approach

7.3.19 **Rope**

a) Make
b) Dimension
c) Specification

7.3.20 **Lifting capacity**

a) Max Lifting capacity (for 360 degree slew) at 3 m radius
   (i) at clear out-reach 0 m
   (ii) at clear outreach 1 m
   (iii) at clear outreach 1.5 m
b) Max Lifting capacity (for 360 degree slew) at 4 m radius
c) On wheels (Stationary)
   : at 3 m radius
   at 4 m radius
   at 5 m radius
d) On wheels (Stationary) :
   with clear outreach 0 m
   with clear outreach 1 m
   with clear outreach 1.5 m
e) Pick and carry capacity (at 4 km/h):
   at 3 m radius
   at 4 m radius
   at 5 m radius
f) Lift of rated load at minimum radius in meters :
   (i) Below ground level
   (ii) Above ground level
g) Gradient unladen
h) Max. travel speed

7.3.21 **Operating speeds**

a) Hoist
b) Slewing RPM
c) Derricking
d) Travelling

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF 40 TONNE CAPACITY ROUGH TERRAIN MOBILE CRANE

1 **Scope of Specification:**

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 40 Tonne capacity hydraulic rough terrain Mobile Crane.

2 **Reference**

The following International Standards are referred to in, and form part of, the Specification:

ISO 4305 :	Mobile cranes - Determination of stability
ISO 7363 :	Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1 :	Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2 :	Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625 :	Cranes – Selection of wire ropes, drums and sheaves

IS 4573-2020 (with latest applicable revision) :Specification for power drive Mobile Cranes / plus Any other ISO specifications, as applicable

3 **Design Criteria**

The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The Crane should have a lifting capacity, with outriggers, of not less than 40 tonne at a radius of 3 m, 360 degree Slew, and a basic boom length of not less than 9 m. The fully extended boom length should be not less than 30 m.

The lifting capacity shall be in accordance with American Standard CS 90-58 and should not exceed 85% of the tipping load in accordance with ISO 4305.
The Crane shall have a gradeability of not less than 40% and should be capable of 360 degree rotation with rated loads.

The crane should be capable of lowering the rated loads a minimum of 4m below ground level and should have adequate pick up and carry capacity of not less than 8 MT at 6m radius over the front.
Ground clearance shall be sufficient for smooth operation both in mines and workshop premises.

4 Technical Requirement

4.1 Engine

The Crane shall be powered by a direct injection 4-stroke, diesel Engine of suitable HP. The Engine shall be provided with 12V/24V electric starting, dry type 2 - stage air-cleaner with automatic dust evacuator and dust level indicator and 2 -stage fuel filter with water separator.
The Engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty Radiator. The system shall be capable of providing sufficient cooling to allow the crane to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the Engine shall be lubricated by an Engine driven oil pump, with full flow oil filtration and cooling.
The Engine shall be equipped with an over-speed governor or a suitable system for governing the speed.

The engine is to be environmentally certified for minimum CEV Stage IV and complying applicable notifications of the Govt. of India at the time of tendering. The Engine electronic control module should be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

4.2 Transmission

The Crane shall be provided with an off-highway power shift hydraulic/ hydrodynamic full power shift torque converter- Transmission having a sufficient number of speeds to enable it to travel in rugged mining conditions.
Suitable protection of the Transmission pan from external damage should be provided. The pan guard should be provided which should be designed to minimize accumulation of dirt and debris.

4.3 Differential & Final Drives-

Suitable 4 x 4-wheel drive-steer with provision for 4 x 2-wheel drive-steer, with suitable Differential and planetary reduction hubs (if applicable) shall be provided.

4.4 Steering

Full hydraulic/ hydrostatic power steering shall be provided, which should have the capability of normalizing steering control when the machine is slewed to the rear of the chassis.

4.5 Hoses

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas.

4.6 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.7 **Brakes**

Suitable reliable fail safe service and parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be disc brake for both Front and Rear.

The service brakes shall be air and/or oil actuated multiple disc type and should operate automatically in the event of low air/oil pressure.

They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.

4.7.2 **Parking brakes**

The parking brakes should be Caliper/Disc Type Brakes.

4.8 **Frame**

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration, with integral outrigger housings. The design must take care of all forces encountered during the operation of the Crane.

4.9 **Outriggers**

An adequate number of hydraulically operated outriggers with horizontal beams and vertical jacks, fitted with integral check- valves/ holding valves on each extension cylinder. The operation of outriggers/ Jacks shall be controlled from the operator's cab and suitable Level Indicator should be provided inside the operator's Cab, within the easy reach of the operator.

4.10 **Boom**

The boom shall be provided with multi-section, full power hydraulic/ power-pinned telescoping sections. Basic length should be not less than 9 meter and extending up to not less than 30 meter.

Dual boom hoist cylinder shall be provided for safe boom elevation to entire range.

4.11 **Lifting Block**

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

4.12 **Hoist System**

A suitable single/ multiple speed hoist system shall be provided with a counter- balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity, shall be provided.

4.13 **Safe Load Indicator**

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and over hoist.

Digital indication of net/ gross load, maximum permissible load, boom

inclination, boom length, radius, shall also be provided.

4.14 **Derricking and Slewing**

High-speed derricking and slewing motions with sensitive fail-safe controls / brakes shall be provided.

Machine should be capable for Full 360 degree continuous rotations.

.4.15 **Drums and sheaves**

The drums and sheaves used for hoisting shall be in accordance with ISO 16625.

4.16 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.17 **Operator's Cab**

A fully insulated, sound suppressed, air-conditioned operator's cab with tinted safety glass having adequate window area to provide full vision in all directions. A rear- view mirror, windshield wipers and washers, a fully adjustable operator's seat, floor mat and a cooling fan shall be provided.

All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.

Steps and handrails shall be provided for access to the operator's cab. FOPS shall be provided as per ISO – ISO3449

4.18 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.19 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the Crane.

d) High torque converter oil temperature
e) Low air pressure (if applicable)

4.20 **Electrical Equipment**

The Crane shall be provided with the following:

c) 12V/24VDC electrical system with suitably rated alternator of reputable Make.
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch
e) Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance.

4.21 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable
f) Front and rear turn indicators

4.22 Guards **and Shields**

Adequate guards and shields, shall be provided throughout the Crane

4.23 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08thJuly2013**.

4.24 **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment

complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Crane.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

4.25 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ alongwith each Crane

i. Front and rear tow hooks and two lifting loops
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered

necessary & essential for satisfactory & safe working of Crane, should be included in the offer.

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components:-

a. Complete Engine System: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b. Transmission Assembly: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

c) Frame, Chassis, Differential & Final Drive- -48 months or 8000 hrs. from the date of commissioning (whichever is earlier)

d) Hydraulic Pumps & Control valves -36 months or 6000 hours from the date of commissioning (whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

6 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than

85% (Eighty- Five Percent) for a period of 12 months from the date of commissioning.

7 **Information to be Provided by the Supplier**

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 **General**

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available

for the present offer, to be furnished in the following format. Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.
d) Details of erection programmes for the bid.
e) Details of maintenance schedule.

7.2 **Technical Details**

a) Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine,
b) Maximum travel speed
c) Turning diameter
d) Detailed technical descriptions of the Crane.
e) Layout drawings and detailed descriptions of all hydraulic systems and components.
f) Details of Comprehensive commercial literature specifications.
g) Detailed list of instrumentation, monitoring and alarm systems.
h) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
i) Lifting capacity range diagrams and tables.
j) Details of safe load indicator.
k) Details of fire detection and suppression system

7.3 **Dimensions, Weights and Performance Details (**All in SI unit wherever applicable)

7.3.1 **Dimensions (in Retracted condition)**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

7.3.2 **Weights**

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Turning circle:
(i) All wheel steer
(ii) Front wheel steer
c) Clearance circle:
(i) All wheel steer
(ii) Front wheel steer

7.3.6 **Brakes**

7.3.6.1 **Service brakes**

7.3.6.1.1 **Front**

a) Type
b) Actuating system

7.3.6.1 .2 **Rear**

a) Type
b) Actuating system

.7.3.6.2 **Parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Starter control make and model
c) Alternator make and model
d) Batteries - numbers and rating
e) Lighting details

7.3.10 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

7.3.11 **Derricking System**

a) Derricking System- Working details
b) Min. to max. radius in secs**.**

7.3.12 **Slew System**

a) Slew System - type & Working details
b) Slew Braking System
c) Slewing Speed (RPM)

7.3.13 **Hoist System**

a) Hoist System - type, Number of Speeds & Working details
b) Brake System - type & Working details
c) Speed Ranges of Hoist System

7.3.14 **Outriggers**

a) No of Outriggers
b) Horizontal stroke
c) Vertical stroke

7.3.15 **Boom**

a) Fully retracted length
c) Intermediate position length
d) Fully extended length

7.3.16 **Boom Telescoping**

a) Speed

7.3.17 **With Derrick down**

a) Overall length
b) Overall height
c) Overall width

7.3.18 **Dimensions**

a) Tail radius (m)
b) Wheel base (m)
c) Ground clearance (mm)
d) Angle of approach

7.3.19 **Rope**

a) Make
b) Dimension
c) Specification

7.3.20 **Lifting capacity**

a) Max Lifting capacity (for 360 degree slew) at 3 m radius
   (i) at clear out-reach 0 m
   (ii) at clear outreach 1 m
   (iii) at clear outreach 1.5 m
b) Max Lifting capacity (for 360 degree slew) at 4 m radius
c) On wheels (Stationary) :
   at 3 m radius
   at 4 m radius
   at 5 m radius
d) On wheels (Stationary) :
   with clear outreach 0 m
   with clear outreach 1 m
   with clear outreach 1.5 m
e) Pick and carry capacity (at 4 km/h) :
   at 3 m radius
   at 4 m radius
   at 5 m radius
f) Lift of rated load at minimum radius in meters :
   (i) Below ground level
   (ii) Above ground level
g) Gradient unladen
h) Max. travel speed

7.3.21 **Operating speeds**

a) Hoist
b) Slewing RPM
c) Derricking
d) Travelling

Equipment Specifications (Part-D):

EQUIPMENT SPECIFICATION OF 30 TONNE CAPACITY ROUGH TERRAIN MOBILE CRANE

1 Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 30 Tonne capacity hydraulic rough terrain Mobile Crane.

2 Reference

The following International Standards are referred to in, and form part of, the Specification:

ISO 4305 :	Mobile cranes - Determination of stability
ISO 7363 :	Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1 :	Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2 :	Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625 :	Cranes – Selection of wire ropes, drums and sheaves

IS 4573-2020 (with latest applicable revision) :Specification for power drive Mobile Cranes / plus

Any other ISO specifications, as applicable

3 Design Criteria

The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The Crane should have a lifting capacity, with outriggers, of not less than 30 tonne at a radius of 3 m, 360 degree Slew, and a basic boom length of not less than 8 m. The fully extended boom length should be not less than 20 m.

The lifting capacity shall be in accordance with American Standard CS 90 -58 and should not exceed 85% of the tipping load in accordance with ISO 4305.
The Crane shall have a gradeability of not less than 40% and should be capable of 360 degree rotation with rated loads.

The Crane should be capable of lowering the rated loads at minimum of 4 meter below ground level and should have adequate pick up and carry capacity of not less

than 5 MT at 6 m radius over the front. Ground clearance shall be sufficient for smooth operation both in mines and workshop premises

4 Technical Requirement

4.1 Engine

The Crane shall be powered by a direct injection 4-stroke, diesel Engine of suitable HP. The Engine shall be provided with 12V/24V electric starting, dry type 2 - stage air-cleaner with automatic dust evacuator and dust level indicator and 2 -stage fuel filter with water separator.
The Engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty Radiator. The system shall be capable of providing sufficient cooling to allow the crane to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the Engine shall be lubricated by an Engine driven oil pump, with full flow oil filtration and cooling.
The Engine shall be equipped with an over-speed governor or a suitable system for governing the speed.

The engine is to be environmentally certified for minimum CEV Stage IV and complying applicable notifications of the Govt. of India at the time of tendering . The Engine electronic control module should be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

4.2 Transmission

The Crane shall be provided with an off-highway power shift hydraulic/ hydrodynamic full power shift torque converter- Transmission having a sufficient number of speeds to enable it to travel in rugged mining conditions.
Suitable protection of the Transmission pan from external damage should be provided. The pan guard should be provided which should be designed to minimize accumulation of dirt and debris.

4.3 Differential & Final Drives-

Suitable 4 x 4-wheel drive-steer with provision for 4 x 2-wheel drive-steer, with suitable Differential and planetary reduction hubs (if applicable) shall be provided.

4.4 Steering

Full hydraulic/ hydrostatic power steering shall be provided, which should have the capability of normalizing steering control when the machine is slewed to the rear of the chassis.

4.5 Hoses

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas.

4.6 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.7 **Brakes**

Suitable reliable fail-safe service and parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be disc brake for both Front and Rear.

The service brakes shall be air and/or oil actuated multiple disc type and should operate automatically in the event of low air/oil pressure.

They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.

4.7.2 **Parking brakes**

The parking brakes should be Caliper Type Brakes.

4.8 **Frame**

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration, with integral outrigger housings. The design must take care of all forces encountered during the operation of the Crane.

4.9 **Outriggers**

An adequate number of hydraulically operated outriggers with horizontal beams and vertical jacks, fitted with integral check- valves/ holding valves on each extension cylinder. The operation of outriggers/ Jacks shall be controlled from the operator’s cab and suitable Level Indicator should be provided inside the operator's Cab, within the easy reach of the operator.

4.10 **Boom**

The boom shall be provided with multi-section, full power hydraulic/ power-pinned telescoping sections. Basic length should be not less than 8 meter and extending up to not less than 20 meter.

Dual boom hoist cylinder shall be provided for safe boom elevation to entire range.

4.11 **Lifting Block**

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

4.12 **Hoist System**

A suitable single/ multiple speed hoist system shall be provided with a counter- balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity,

shall be provided.

4.13 **Safe Load Indicator**

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and Over

hoist.
Digital indication of net/ gross load, maximum permissible load, boom inclination, boom length, radius, shall also be provided.

4.14 **Derricking and Slewing**

High-speed derricking and slewing motions with sensitive fail-safe controls / brakes shall be provided.
Machine should be capable for Full 360 degree continuous rotations.

.4.15 **Drums and sheaves**

The drums and sheaves used for hoisting shall be in accordance with ISO 16625.

4.16 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.17 **Operator's Cab**

A fully insulated, sound suppressed, air-conditioned operator's cab with tinted safety glass having adequate window area to provide full vision in all directions. A rear- view mirror, windshield wipers and washers, a fully adjustable operator's seat, floor mat and a cooling fan shall be provided.
All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.
Steps and handrails shall be provided for access to the operator's cab. FOPS shall be provided as per ISO – ISO3449

4.18 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.19 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual

alarm while reversing the equipment should have a flasher/blinker at the rear end of the Crane.

d) High torque converter oil temperature
e) Low air pressure (if applicable)

4.20 **Electrical Equipment**

The Crane shall be provided with the following:

a) 12V/24VDC electrical system with suitably rated alternator of reputable Make.
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch
e) Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall be easily accessible for maintenance.

4.21 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable
f) Front and rear turn indicators

4.22 **Guards and Shields**

Adequate guards and shields, shall be provided throughout the Crane

4.23 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval) CircularNo.02 dtd. 08thJuly2013**.

4.24 **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Crane.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

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4.25 **Auxiliary equipment and other requirement :**

The following shall also be provided on/ along with each Crane

i. Front and rear tow hooks and two lifting loops
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror

vi. Operator seat belt

vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory & safe working of Crane, should be included in the offer.

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components:-

a. Complete Engine System: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b. Transmission Assembly: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

c) Frame, Chassis, Differential & Final Drive- -48 months or 8000 hrs. from the date of commissioning (whichever is earlier)

d) Hydraulic Pumps & Control valves -36 months or 6000 hours from the date of commissioning (whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

6 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than **85% (Eighty- Five Percent)** for a period of 12 months from the date of commissioning

7 **Information to be Provided by the Supplier**

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 **General**

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-
Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.

Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.
d) Details of erection programmes for the bid.
e) Details of maintenance schedule.

7.2 **Technical Details**

a) Latest engine performance curves showing net power, net torque and
b) specific fuel consumption of the installed engine,
c) Maximum travel speed
d) Turning diameter
e) Detailed technical descriptions of the Crane.
f) Layout drawings and detailed descriptions of all hydraulic systems and components.
g) Details of Comprehensive commercial literature specifications.
h) Detailed list of instrumentation, monitoring and alarm systems.
i) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
j) Lifting capacity range diagrams and tables.
k) Details of safe load indicator.
l) Details of fire detection and suppression system

7.3 **Dimensions, Weights and Performance Details (**All in SI unit wherever applicable)

7.3.1 **Dimensions (in Retracted condition)**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

7.3.2 **Weights**

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at.....r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio

c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Turning circle:
(i) All wheel steer
(ii) Front wheel steer
c) Clearance circle:
(i) All wheel steer
(ii) Front wheel steer

7.3.6 **Brakes**

7.3.6.1 **Service brakes**

7.3.6.1.1 **Front**

a) Type
b) Actuating system

7.3.6.1 .2 **Rear**

a) Type
b) Actuating system

.7.3.6.2 **Parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries - numbers and rating
d) Lighting details

7.3.10 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

7.3.11 **Derricking System**

a) Derricking System- Working details

b) Min. to max. radius in secs**.**

7.3.12 **Slew System**

a) Slew System - type & Working details

b) Slew Braking System

c) Slewing Speed (RPM)

7.3.13 **Hoist System**

a) Hoist System - type, Number of Speeds & Working details

b) Brake System - type & Working details

c) Speed Ranges of Hoist System

7.3.14 **Outriggers**

a) No of Outriggers

b) Horizontal stroke

c) Vertical stroke

7.3.15 **Boom**

a) Fully retracted length

c) Intermediate position length

d) Fully extended length

7.3.16 **Boom Telescoping**

a) Speed

7.3.17 **With Derrick down**

a) Overall length

b) Overall height

c) Overall width

7.3.18 **Dimensions**

a) Tail radius (m)

b) Wheel base (m)

c) Ground clearance (mm)

d) Angle of approach

7.3.19 **Rope**

a) Make

b) Dimension

c) Specification

7.3.20 **Lifting capacity**

a) Max Lifting capacity (for 360 degree slew) at 3 m radius

(i) at clear out-reach 0 m

(ii) at clear outreach 1 m

(iii) at clear outreach 1.5 m

b) Max Lifting capacity (for 360 degree slew) at 4 m radius

c) On wheels (Stationary) :

at 3 m radius
at 4 m radius
at 5 m radius

d) On wheels (Stationary) :
with clear outreach 0 m
with clear outreach 1 m
with clear outreach 1.5 m

e) Pick and carry capacity (at 4 km/h) :
at 3 m radius
at 4 m radius
at 5 m radius

f) Lift of rated load at minimum radius in meters :
(i) Below ground level
(ii) Above ground level

g) Gradient unladen

h) Max. travel speed

7.3.21 **Operating speeds**

a) Hoist

b) Slewing RPM

c) Derricking

d) Travel

EQUIPMENT SPECIFICATION OF 20 TONNE CAPACITY ROUGH TERRAIN MOBILE CRANE

1 Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 20 Tonne capacity hydraulic rough terrain Mobile Crane.

2 Reference

The following International Standards are referred to in, and form part of, the Specification:

ISO 4305 :	Mobile cranes - Determination of stability
ISO 7363 :	Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1 :	Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2 :	Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625 :	Cranes – Selection of wire ropes, drums and sheaves

IS 4573-2020 (with latest applicable revision) :Specification for power drive Mobile Cranes / plus

Any other ISO specifications, as applicable

3 Design Criteria

The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

The Crane should have a lifting capacity, with outriggers, of not less than 20 tonne at a radius of 3 m, 360 degree Slew, and a basic boom length of not less than 8 m. The fully extended boom length should be not less than 20 m.

The lifting capacity shall be in accordance with American Standard CS 90-58 and should not exceed 85% of the tipping load in accordance with ISO 4305.
The Crane shall have a gradeability of not less than 40% and should be capable of 360 degree rotation with rated loads.

The Crane should be capable of lowering the rated loads at minimum of 4 meter below ground level and should have adequate pick up and carry capacity of not less than 4 MT at 6 m radius over the front. Ground clearance shall be sufficient for smooth operation both in mines and workshop premises

4 Technical Requirement

4.1 Engine

The Crane shall be powered by a direct injection 4-stroke, diesel Engine of suitable HP. The Engine shall be provided with 12V/24V electric starting, dry type 2- stage

air-cleaner with automatic dust evacuator and dust level indicator and 2-stage fuel filter with water separator.
The Engine shall have a water jacket cooling system, thermostatically controlled, using an engine driven water pump, with the cooling water re-circulated through a heavy duty Radiator. The system shall be capable of providing sufficient cooling to allow the crane to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the Engine shall be lubricated by an Engine driven oil pump, with full flow oil filtration and cooling.
The Engine shall be equipped with an over-speed governor or a suitable system for governing the speed.

The engine is to be environmentally certified for minimum CEV Stage IV and complying applicable notifications of the Govt. of India at the time of tendering . The Engine electronic control module should be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

4.2 Transmission

The Crane shall be provided with an off-highway power shift hydraulic/ hydrodynamic full power shift torque converter- Transmission having a sufficient number of speeds to enable it to travel in rugged mining conditions.
Suitable protection of the Transmission pan from external damage should be provided. The pan guard should be provided which should be designed to minimize accumulation of dirt and debris.

4.3 Differential & Final Drives-

Suitable 4 x 4-wheel drive-steer with provision for 4 x 2-wheel drive-steer, with suitable Differential and planetary reduction hubs (if applicable) shall be provided.

4.4 Steering

Full hydraulic/ hydrostatic power steering shall be provided, which should have the capability of normalizing steering control when the machine is slewed to the rear of the chassis.

4.5 **Hoses**

All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas.

4.6 **Tyres**

Suitable Tubeless, rock duty, cut-resistant tyres shall be provided to meet the requirement of operating parameters given in the design criteria.

4.7 **Brakes**

Suitable reliable fail-safe service and parking brakes shall be provided.

4.7.1 **Service brakes**

Service Brake should be disc brake for both Front and Rear.
The service brakes shall be air and/or oil actuated multiple disc type and should

operate automatically in the event of low air/oil pressure.
They should preferably be fully enclosed to prevent entry of dust and water, and designed for low maintenance.

4.7.2 **Parking brakes**

The parking brakes should be Caliper Type Brakes.

4.8 **Frame**

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration, with integral outrigger housings. The design must take care of all forces encountered during the operation of the Crane.

4.9 **Outriggers**

An adequate number of hydraulically operated outriggers with horizontal beams and vertical jacks, fitted with integral check- valves/ holding valves on each extension cylinder. The operation of outriggers/ Jacks shall be controlled from the operator's cab and suitable Level Indicator should be provided inside the operator's Cab, within the easy reach of the operator.

4.10 **Boom**

The boom shall be provided with multi-section, full power hydraulic/ power-pinned telescoping sections. Basic length should be not less than 8 meter and extending up to not less than 20 meter.
Dual boom hoist cylinder shall be provided for safe boom elevation to entire range.

4.11 **Lifting Block**

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

4.12 **Hoist System**

A suitable single/ multiple speed hoist system shall be provided with a counter-balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity,
shall be provided.

4.13 **Safe Load Indicator**

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and over hoist.
Digital indication of net/ gross load, maximum permissible load, boom inclination, boom length, radius, shall also be provided.

4.14 **Derricking and Slewing**

High-speed derricking and slewing motions with sensitive fail-safe controls / brakes shall be provided.
Machine should be capable for Full 360 degree continuous rotations.

.4.15 **Drums and sheaves**

The drums and sheaves used for hoisting shall be in accordance with ISO 16625.

4.16 **Fuel Tank**

The fuel tank shall be of sufficient capacity and be provided with a level indicator

and a lockable hinged filler cap. The construction of the tank should be such that it provided for easy accumulation and drainage of water with minimum loss of fuel and arrangement of man hole for cleaning the tank from inside.

4.17 **Operator's Cab**

A fully insulated, sound suppressed, air-conditioned operator's cab with tinted safety glass having adequate window area to provide full vision in all directions. A rear-view mirror, windshield wipers and washers, a fully adjustable operator's seat, floor mat and a cooling fan shall be provided.

All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.

Steps and handrails shall be provided for access to the operator's cab.

FOPS shall be provided as per ISO –ISO3449

4.18 **Gauges and Indicators:**

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

4.19 **Warning Alarms:**

The following audio/visual warning alarms shall be provided:

a) Low Engine oil pressure
b) High Coolant Temperature
c) Reversing. It must be audio & visual both. Audio-visual alarm while reversing the equipment should have a flasher/blinker at the rear end of the Crane.
d) High torque converter oil temperature
e) Low air pressure (if applicable)

4.20 **Electrical Equipment**

The Crane shall be provided with the following:

a) 12V/24VDC electrical system with suitably rated alternator of reputable Make.
b) Electric start
c) Reputable make high capacity batteries
d) Battery isolation switch
e) Electric wires are to be passed through flexible conduit to avoid damage of insulation of the wire due to friction that may cause short circuit. All electrical circuits shall be protected by adequately rated fuses/circuit breakers which shall

be easily accessible for maintenance.

4.21 **Lighting**

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

a) Front and Rear lights
b) Stop and tail lights
c) Instrument panel and cab light
d) Fog Lamps
e) Socket with switch for pendent light with minimum 5 Meter cable
f) Front and rear turn indicators

4.22 **Guards and Shields**

Adequate guards and shields, shall be provided throughout the Crane

4.23 **Fire Extinguishers**

An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS (Approval)CircularNo.02 dtd. 08thJuly2013**.

4.24 **Automatic Fire Detection and Suppression System**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying **Clause-5**of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the Crane.
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighbourhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for

effective fire fighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.

- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards. Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

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4.25 **Auxiliary equipment and other requirement:**

The following shall also be provided on/ along with each Crane

i. Front and rear tow hooks and two lifting loops
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory & safe working of Crane, should be included in the offer.

5 **Special Guarantee - Warranty Clause**

The following guarantee will apply for the different components:-

a. Complete Engine System: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

b. Transmission Assembly: **24 months or 5000 Hours** from the date of commissioning (whichever is earlier)

c) Frame, Chassis, Differential & Final Drive- -48 months or 8000 hrs. from the date of commissioning (whichever is earlier)

d) Hydraulic Pumps & Control valves -36 months or 6000 hours from the date of commissioning (whichever is earlier)

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

In case of any failure of the above sub-assemblies beyond the Special Guarantees period specified above and within contract period, the replacement / rectification work [as per guarantee settlement] shall be completed at site within 14 days at no

cost to the purchaser. In any case, liability of manufacturer shall be limited for a period for entire contract period.

In case of any dispute, decision of Head of Excavation Department of subsidiary shall be final and binding for both supplier and purchaser

6 **Performance Guarantee**

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are (to be defined by subsidiary….) … hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

The supplier shall guarantee that the availability of the equipment shall not be less than **85% (Eighty- Five Percent)** for a period of 12 months from the date of commissioning

7 **Information to be provided by the Supplier**

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

7.1 **General**

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-Comm. Date

b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.
Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value ------ Location, Type of Facility, No of Engineers

c) Details of tools to be provided with the equipment.

d) Details of erection programmes for the bid.

e) Details of maintenance schedule.

7.2 **Technical Details**

a) Latest engine performance curves showing net power, net torque and
b) specific fuel consumption of the installed engine,
c) Maximum travel speed
d) Turning diameter
e) Detailed technical descriptions of the Crane.
f) Layout drawings and detailed descriptions of all hydraulic systems and components.
g) Details of Comprehensive commercial literature specifications.
h) Detailed list of instrumentation, monitoring and alarm systems.
i) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
j) Lifting capacity range diagrams and tables.
k) Details of safe load indicator.
l) Details of fire detection and suppression system

7.3 **Dimensions, Weights and Performance Details (**All in SI unit wherever applicable)

7.3.1 **Dimensions (in Retracted condition)**

a) Maximum overall length
b) Maximum overall width
c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

7.3.2 **Weights**

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

7.3.3 **Engine**

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at..... r/min
g) Maximum torque

7.3.4 **Final Drive**

a) Type and make
b) Differential ratio
c) Planetary ratio

7.3.5 **Steering**

a) Type and make
b) Turning circle:
(i) All wheel steer
(ii) Front wheel steer
c) Clearance circle:
(i) All wheel steer
(ii) Front wheel steer

7.3.6 **Brakes**

7.3.6.1 **Service brakes**

7.3.6.1.1 **Front**

a) Type
b) Actuating system

7.3.6.1 .2 **Rear**

a) Type
b) Actuating system

.7.3.6.2 **parking brake**

a) Type
b) Actuating system

7.3.7 **Tyres**

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

7.3.8 **Hydraulic System**

a) Number, flow rates, operating pressures and Make & type of pumps
b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

7.3.9 **Electrical System**

a) Starter make and model
b) Alternator make and model
c) Batteries - numbers and rating
d) Lighting details

7.3.10 **Transmission**

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

7.3.11 **Derricking System**

a) Derricking System- Working details
b) Min. to max. radius in secs**.**

7.3.12 **Slew System**

a) Slew System - type & Working details
b) Slew Braking System
c) Slewing Speed (RPM)

7.3.13 **Hoist System**

a) Hoist System - type, Number of Speeds & Working details
b) Brake System - type & Working details
c) Speed Ranges of Hoist System

7.3.14 **Outriggers**

a) No of Outriggers
b) Horizontal stroke
c) Vertical stroke

7.3.15 **Boom**

a) Fully retracted length
c) Intermediate position length
d) Fully extended length

7.3.16 **Boom Telescoping**

a) Speed

7.3.17 **With Derrick down**

a) Overall length
b) Overall height
c) Overall width

7.3.18 **Dimensions**

a) Tail radius (m)
b) Wheel base (m)
c) Ground clearance (mm)
d) Angle of approach

7.3.19 **Rope**

a) Make
b) Dimension
c) Specification

7.3.20 **Lifting capacity**

a) Max Lifting capacity (for 360 degree slew) at 3 m radius
(i) at clear out-reach 0 m
(ii) at clear outreach 1 m
(iii) at clear outreach 1.5 m
b) Max Lifting capacity (for 360 degree slew) at 4 m radius
c) On wheels (Stationary) :
at 3 m radius
at 4 m radius
at 5 m radius
d) On wheels (Stationary) :
with clear outreach 0 m
with clear outreach 1 m
with clear outreach 1.5 m
e) Pick and carry capacity (at 4 km/h) :

at 3 m radius
at 4 m radius
at 5 m radius

f) Lift of rated load at minimum radius in meters :
(i) Below ground level
(ii) Above ground level

g) Gradient unladen

h) Max. travel speed

7.3.21 **Operating speeds**

a) Hoist

b) Slewing RPM

c) Derricking

d) Travel

EQUIPMENT SPECIFICATION OF 10 TONNE CAPACITY PICK AND CARRY HYDRAULIC MOBILE CRANE

D.1 Scope of Specification:

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, 10 Tonne capacity Pick and carry Mobile Hydraulic crane.

D.2. Reference

The following International Standards are referred to in, and form part of, the Specification:
ISO 4305 : Mobile cranes - Determination of stability
ISO 7363 : Cranes and lifting appliances - Technical characteristics and acceptance documents
ISO 7752-1 : Lifting appliances - Controls - Layout and characteristics (Part1) General principles
ISO 7752-2 : Lifting appliances- Controls- Layout & characteristics (Part-2) Basic arrangement and requirements for Mobile Cranes
ISO 16625 : Cranes – Selection of wire ropes, drums and sheaves
IS 4573-2020 (with latest applicable revision): Specification for power drive Mobile Cranes / plus Any other ISO specifications, as applicable

D.3. Design Criteria

The Crane shall be designed for heavy duty application in the extreme mining conditions at Opencast Mines and be capable of operating for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year.

D.4 Technical Requirement

D.4.1 Capacity –

Single operator hydraulic mobile crane with Rear mounted cabin , having better visibility , should have the capacity to Pick and Carry the rated load not less than 10tonne/ 10000Kgs at an approximate horizontal distance of 1.50 metres from the centre of the front wheel and with minimum front horizontal clearance of approximately 900 mm. The crane should be capable of lowering / picking the rated loads up to not less than 5 metres below the ground level

D.4.2 Engine –

The Crane shall be powered by a direct injection 4-stroke water cooled diesel Engine of suitable HP with a continuous output rating & compatible with the crane requirement. The engine is to be environmentally certified complying applicable notifications of Govt. of India at the time of tendering.

D.4.3.Transmission –

The Crane shall be provided with a suitable heavy duty transmission developed especially for crane application.
It should be sliding mesh, spur teeth gear box. It shall have a minimum of 6 forward and 2 reverse speeds with high-low range selector.

Speed : Travel speed 25 Kmph - restricted (without load).

D.4.4. Boom –
The boom should be telescopic type fitted with hydraulic winch of suitable capacity for hoisting in four falls of wire rope. The telescopic action should be adequately quick and hydraulically operated. The boom should be of two part, box type.

The horizontal fixed boom length should not be less than 3.75 metres from the centre of the front wheel and total boom length after extension not be less than 5.50 metres from the centre of the front wheel.

The boom height of hook, fitted with winch, from the ground level shall not be less than 7.0 metres. Derricking should be through double acting hydraulic cylinders.

D.4.5 Wire Rope –
Suitable diameter Non-rotating wire rope shall be provided for safe lifting of load.

D.4.6 Steering –
The steering system shall be Articulated, Hydraulically controlled by lever through two double acting hydraulic cylinders. The minimum articulation angle should be about 55º each side and Turning radius not less than 5.0 Metres.

D.4.7 Hooks –
The crane should have swivel hooks for different capacity loads with safety lock.

D.4.8 Tyres - Suitable Pneumatic tyres shall be provided to meet the requirement of operating parameters given in the design criteria.
Minimum No. of tyres for front - 4 nos. & rear - 2 nos. shall be provided

D.4.9 Brakes –
Suitable fail safe reliable service brakes for front & rear wheels and parking brakes on rear wheels shall be provided. Front wheels are to be fitted with pneumatically assisted hydraulic fluid brakes which are to be operated through slave cylinders and for rear wheels mechanical type brakes shall be provided. For proper synchronization of rear and front wheel brakes, a single foot pedal is to be provided. The parking brake shall be of mechanically actuated type.

Fail safe brakes shall be provided in the hoist system.

D.4.10 Hoses –
All hoses shall be grouped as far as possible and suitably clipped to reduce damage from scuffing. Fire/Heat resistant hoses are to be provided in hot zone areas.

D.4.11 Hydraulic system –
Suitable capacity hydraulic pumps for Steering, hoist & Derricking and control valve & control system shall be provided for efficient and fast action of different operations.

D.4.12 Operator Cabin:-
A fully insulated, sound suppressed lockable, walk- through operator cabin with tinted safety glass having adequate window area to provide full vision in all directions. A rear-view mirror, windshield wipers and washers, a fully adjustable operator's seat with seat

belt, floor mat and a cooling fan, seating arrangement for at least one person in addition to operator shall be provided.

All operating controls, gauges (with color indication for safe and unsafe working), monitoring and working signals shall be conveniently located within easy reach of the operator and comply with ISO 7752-1 and ISO7752-2.

Steps and handrails shall be provided for access to the operator's cab. The FOPS of the cabin shall be provided as per IS4573:2020 (latest applicable revision) or equivalent ISO as per requirement of DGMS.

D.4.13 Joy Stick/hand held lever operated-
The left, right boom in-out, articulation and hoist operation / motions to be controlled by joy stick / lever operated. The levers should be within the easy reach of the operator.

D.4.14 Front Axle Oscillation & Ground Clearance –
The crane shall be designed for rough terrain operation as well as workshop i.e. open cast coal mines area.

The crane shall be provided with ground clearance of not less than 200mm.

D.4.15 Fuel & Hydraulic Tank –
The tanks shall be of sufficient capacity and be properly secured and be provided with a level indicator. Both tanks should be provided with suitable cap.

D.4.16 Warning Alarms / Lights /Control system –
The crane should have automatic over hoist / over load warning system. The crane should be fitted with following lights / Lamps and warning systems –

1. Over hoist audio warning system
2. Overload audio warning system
3. Safe Load Indicator with hydraulic cut off
4. Head Lamps with auto-dipping system
5. Parking lights
6. Front & Rear service lamps
7. Cabin light
8. Turn and reverse lamps
9. Instrument panel lamps
10. Air / electrical horn
11. Audio-visual alarm while reversing crane. Visual should be blinking type.
12. Rear view mirror
13. Windshield wiper

D.4.17 Electrical Equipment –
The Crane shall be provided with the following –

1. 12 V DC electrical system with suitably rated alternator of reputed make
2. Electric starter motor (12V) of reputed make
3. Battery of 12 Volts of suitable Ah rating - 1 No. of reputed make
4. Battery isolation switch
5. Heavy duty starting switch.

All electrical circuits shall be protected by rated fuses which shall be easily accessible

for maintenance. At least two spare fuses of each size shall be provided in each fuse box.

D.4.18 Guards and Shields –
Adequate guards and shields shall be provided throughout the crane to protect from damage during operation on rough terrain condition.

D.4.19 Standard Accessories –
Front bumper, lift cylinder guard, swivel hooks for different capacity load & Spark arrestor.

D.4.20 Fire Extinguisher –
An adequate number (not less than 02 nos.) fire extinguisher shall be provided on the Crane, suitably mounted in heavy-duty bracket for ease of removal. The extinguisher shall be dry powder (cartridge type) with a minimum capacity of **5 kg** and shall comply with Indian Standard IS: 15683 with latest amendment.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for fire extinguisher including Materials and Chemicals to be used in fire extinguisher from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. **DGMS(Approval)CircularNo.02 dtd. 08thJuly2013**.

D.4.21 Auxiliary equipment and other requirement
The following shall also be provided on/ along with each Crane

i. Front tow hooks and lifting loops
ii. Horn.
iii. General Tool kit for repair and maintenance with list and quantity.
iv. Tyre inflation kit.
v. Rear View Mirror
vi. Operator seat belt
vii. Any other item specifically not mentioned above, if considered necessary & essential for satisfactory & safe working of Crane, should be included in the offer.

D.4.22 Lighting

Adequate lighting shall be provided for safe nightshift operation. The lighting system should include the following:

g) Front and Rear lights
h) Stop and tail lights
i) Instrument panel and cab light
j) Fog Lamps
k) Socket with switch for pendent light with minimum 5 Meter cable
l) Front and rear turn indicators

D.4.23 Gauges and Indicators:

The following shall be provided:

a) Water temperature
b) Engine oil pressure
c) Transmission oil / Converter oil pressure (if applicable)
d) Transmission oil / Converter oil temperature (if applicable)
e) Fuel Capacity
f) Engine tachometer
g) Engine hour-meter
h) Air pressure (if applicable)

In case any of these Gauges/Indicators are not provided, then it must be adequately explained how job of the same would be accomplished.

D.4.24 Frame

The frame should be a rugged, durable construction of high strength steel, free from any stress concentration. The design must take care of all forces encountered during the operation of the Crane.

D.4.25 Lifting Block

A hook block suitable for the maximum designed lifting capacity of the Crane shall be provided.

D.4.26 Hoist System

A suitable single/ multiple speed hoist system shall be provided with a counter-balance valve for controlled load lowering. Limit switches for over-hoist, indicator for over-lowering and fail-safe braking system of adequate capacity shall be provided.

D.4.27 Safe Load Indicator

The crane shall be fitted with an electronic safe load indicator to indicate the hook load and provide audio-visual warning for overload and Over hoist. Digital indication of net/ gross load, maximum permissible load, boom inclination, boom length, radius, shall also be provided.

D.5 Performance Guarantee –

The supplier shall guarantee that the availability of the equipment shall **not be less than 85% (Eighty- Five Percent)** for a period of 12 months from the date of commissioning

The expected scheduled working hours of the equipment shall be 1500 (One thousand & five hundred) per year.

D.6 Special Guarantee -

The following guarantee will apply for the different components:-

a) Complete Engine system- 24 months or 5000 hours from the date of commissioning (whichever is earlier).
b) Transmission Assy. –24 months or 5000 hours from the date commissioning (whichever is earlier).

In case of any guarantee failure intimated reasonably in time to the bidder, the replacement or repair job (as per guarantee settlement) must be completed within 21 days at site by the bidder at no cost to the purchaser.

D.7 Information to be Provided by the Supplier

The Supplier shall furnish the following information. All technical information shall be in **SI units**.

D.7.1 General

a) Number of offered model commissioned during the last five years from the date of opening of tender.
The information shall be given in the following format.
Company-Mine Name-Mine Location-Mine Type-No of machine-Model-Comm. Date
b) Details of nearest Depot/Warehouse and Service Facility available for the present offer, to be furnished in the following format.
Major Depot/Warehouse---Service Facility ---Location, Contact Nos, Inventory Value ------ Location, Type of Facility, No of Engineers
c) Details of tools to be provided with the equipment.
d) Details of erection programmes for the bid.
e) Details of maintenance schedule.

D.7.2 Technical Details

m) Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine,
n) Maximum travel speed
o) Turning diameter
p) Detailed technical descriptions of the Crane.
q) Layout drawings and detailed descriptions of all hydraulic systems and components.
r) Details of Comprehensive commercial literature specifications.
s) Detailed list of instrumentation, monitoring and alarm systems.
t) Details of major bought-out assemblies and sub-assemblies including manufacturer, type, etc.
u) Lifting capacity range diagrams and tables.
v) Details of safe load indicator.

D.7.3 Dimensions, Weights and Performance Details (All in SI unit wherever applicable)

D.7.3.1 Dimensions (in Retracted condition)

a) Maximum overall length
b) Maximum overall width

c) Maximum height
d) Tail radius
e) Wheel base
f) Ground clearance

D.7.3.2 Weights

a) Operating weight - front wheels
b) Operating weight - rear wheels
c) Total operating weight

D.7.3.3 Engine

a) Manufacturer and model
b) Number of cylinders
c) Bore
d) Stroke
e) Displacement
f) ISO net power at..... r/min
g) Maximum torque

D.7.3.4 Final Drive

a) Type and make
b) Differential ratio
c) Planetary ratio

D.7.3.5 Steering

a) Type and make
b) Turning circle
c) Clearance circle

D.7.3.6 Brakes

D.7.3.6.1 Service brakes

D.7.3.6.1.1 Front

a) Type
b) Actuating system

D.7.3.6.1 .2 Rear

a) Type
b) Actuating system

D.7.3.6.2 Parking brake

a) Type
b) Actuating system

D.7.3.7 Tyres

a) Make
b) Size and type
c) Tread
d) Ply rating
e) Rim size

D.7.3.8 Hydraulic System

a) Number, flow rates, operating pressures and Make & type of pumps

b) Number, piston diameters, stroke lengths and make & model of cylinders
c) Relief valve operating pressures

D.7.3.9 Electrical System

a) Starter make and model
b) Alternator make and model
c) Batteries – make, numbers and rating (AH & CCA)
d) Lighting details

D.7.3.10 Transmission

a) Make and model
b) Type
c) Number of gear speeds - forward and reverse
d) Travel speeds - forward and reverse

D.7.3.11 Derricking System

a) Derricking System- Working details
b) Min. to max. radius in sec

D.7.3.12 Hoist System

a) Hoist System - type, Number of Speeds & Working details
b) Brake System - type & Working details
c) Speed Ranges of Hoist System

D.7.3.13 Boom

a) Fully retracted length
b) Intermediate position length
c) Fully extended length

D.7.3.14 Boom Telescoping

a) Speed

D.7.3.15 With Derrick down

a) Overall length
b) Overall height
c) Overall width

D.7.3.16 Dimensions

a) Tail radius (m)
b) Wheel base (m)
c) Ground clearance (mm)
d) Angle of approach

D.7.3.17 Rope

a) Make
b) Dimension
c) Specification

D.7.3.20 Lifting capacity

a) Max Lifting capacity at 1.5 m radius

b) Max Lifting capacity at 4.0 m radius
c) On wheels (Stationary):
at 3 m radius
at 4 m radius
at 5 m radius
d) Pick and carry capacity (at 4 km/h) :
at 3 m radius
At 4m radius
At 5 m radius
e) Lift of rated load at minimum radius in meters :
(i) Below ground level
(ii) Above ground level
f) Gradient unladen
g) Max. travel speed

D.7.3.21Operating speeds

a) Hoist
b) Derricking
c) Travel

Surface Miner

PART-D.
EQUIPMENT SPECIFICATION OF SURFACE MINER HAVING DRUM WIDTH

NOT LESS THAN 3800 MM TO BE OPERATED IN WINDROW MODE

D.1. Scope of Specification

This specification is intended to cover the technical requirements for the design, manufacture, testing, delivery, on-site erection and commissioning of a diesel powered, self-propelled, crawler mounted surface miner for cutting and sizing of coal.

D.2. References

Relevant ISO/SAE references/standards compliance of which shall be followed in the offered equipment needs to be indicated.

D.3. Design Criteria

The surface miner shall be capable of continuous operation for protracted periods on a system of 3 shifts each of 8 hours duration per day throughout the year in coal mines of CIL. The Surface Miners are to be operated in Windrow Mode.

The surface miner shall have the following minimum working ranges.

- **a.** Drum width - EQUAL or MORE than 3800mm
- **b.** Cutting Depth - EQUAL or MORE than 250 mm
- **c.** Size of excavated product (Coal) - EQUAL or LESS than 100 mm
- **d.** Compressive strength of material to be cut- EQUAL or MORE than 700Kg/Cm²
- **e.** Rated Productivity - EQUAL or MORE than 600 Cum /hour

D.4. Technical Requirements

D.4.1. Engine

The Surface Miner shall be powered by a direct injection 4-stroke diesel engine of suitable HP with a continuous output rating compatible with the Surface Miner's requirement. The engine shall be provided with 24V electric starting, dry type 2-stage air-cleaner with dust evacuator and dust level indicator and 2-stage fuel filter with water separator. The engine shall have a coolant jacket cooling system, thermostatically controlled, using an engine driven coolant pump, with the coolant re-circulated through a heavy-duty radiator. The system shall be capable of providing sufficient cooling to allow the Surface Miner to continuously operate at the full rated output at the maximum ambient temperature. The moving parts of the engine shall be lubricated by an engine driven oil pump, with full flow oil filtration and cooling. The engine shall be equipped with an over-speed governor, environmental friendly and fuel efficient engine. The Engine shall have turbocharger guard and baffle plate to guard against hot zone.

Bidder shall have to submit a self-certificate that offered engine is fuel efficient and environmental friendly.

The engine is to be fuel efficient having fully integrated electronically controlled monitoring system & real-time self-diagnostic features with built in protections. The Engine electronic control module should be fully integrated with all systems of power train for all operating conditions and be capable to monitor operator's and sensors inputs for optimum engine performance & reduced emissions level. All engine vital parameter data shall be integrated with On Board Display (OBD) system of operator's cabin.

The engine shall be environment friendly with **environmental emission norm of** minimum **EPA Tier II** or equivalent or above standard certified /compliance. However, higher environmental standard, if any, shall be applicable as per notification of Govt. of India at the time of supply. Certificate for **EPA Tier II** or equivalent or above standard certified /compliance from engine manufacturer is to be enclosed.

A suitable electronic tool (laptop) loaded with compatible software and all related accessories shall be provided project wise **(1 no. laptop for a fleet up to 3 nos. or part there off for each project)** along with special tools for retrieval and analysis of the recorded critical parameters of self-diagnostic features, real time monitoring and equipment health-monitoring systems fitted with the equipment. The supplier shall also be required to provide readable reports downloaded from each Equipment.

Compatible Software loaded in electronic tool (Laptop) should be warranted for entire contract period.

D.4.2 Drive system

The power transmission from the engine to the crawler drive sprocket should either be through conventional means i.e. torque flow transmission, differential, final drive, steering and brakes or through any other proven means.

D.4.3 Brakes

Suitable reliable service, secondary and parking brakes as per relevant ISO standard shall be provided.

D.4.4 Undercarriage

The undercarriage shall be heavy duty rugged, suitably designed to reduce shock loads transmitted to the Surface Miner and accomplish the job for which machine is intended for use.

D.4.5 Track suspension:

Suitable Track suspension shall be provided.

D.4.6 Chassis

It should be torsion-proof welded design with mounts for the individual components and parts, as well as integrated tanks for fuel, hydraulic fluid and water. All components should be easily accessible for maintenance and repair.

D.4.7 Fuel Tank

The fuel tank shall be of sufficient capacity to allow 16 hours operation without re-fueling and be provided with a level indicator and a lockable hinged cap. Construction of the tank should be such that it provides for easy accumulation and drainage of water with minimum loss of fuel. Anti-pilferage device shall be provided in the tank.

Sufficiency of Fuel Tank calculation shall be submitted.

D.4.8 Operator's Station:

A suitable Operator's Station shall be provided on the equipment as per Gazette notification issued by Chief Inspector of Mines vide F.No. Z-20045/01/2018/S&T (HQ) Dhanbad, the 1st October, 2018.

D.4.8.1 Operator's Cabin:

A fully insulated, high-visibility, rigidly mounted, sound-suppressed, vibration-suppressed, air conditioned, operator's cab with tinted safety glass should be so positioned to facilitate a clear and unrestricted view of the travel & work areas of the machine necessary for its intended use. The performance criteria shall be in accordance with ISO 5006. The sound level inside the cab shall be below 85dBA while the equipment is operating, and with the door closed. All operating controls, all monitoring, working signals and emergency switch to stop the engine should be conveniently located in consoles within easy reach of the operator and shall comply with ISO: 6405-1, ISO: 6405-2, ISO: 6682 & ISO: 10968. The operator's cab shall be provided with an emergency exit in addition to primary access path to the cabin.

Alternative opening (Emergency Exit): An alternative opening shall be provided on a side other than that of the primary opening. A window panel or another door is acceptable if they are easy to open or remove without the use of keys or tools. Latches may be used if they can be opened from the inside without the use of keys or tools. The breaking of a suitable size of glass pane is considered to represent a suitable alternative opening, provided that the necessary pane hammer, immediately accessible to the operator, is provided and stored in the cab. When the window panel is used as an emergency exit, it shall bear an appropriate marking.

Doors, Windows and flaps shall be securely held in their intended operating positions. Doors shall be retained at their intended operating positions by a positive engagement device. The front glass shall be fitted with motorized wind screen wipers and washers. The tank of the front glass washers shall be easily accessible.

Pipes and hoses that contain fluids at pressures exceeding 5MPa or temperatures above 60ºC located inside the cab shall be suitably guarded.

Periodical maintenance of Air Condition system including gas refilling to be done by the supplier during the contract period

D.4.8.2 Operator's Protective Structures:

Grader shall be equipped with FOPS as per ISO –ISO3449 & ROPS as per ISO 3471/ ISO 12117-2

D.4.8.3 Operator's Seats:

The Operator's Station shall be fitted with an ergonomically designed adjustable seat that supports the operator in a position that allows the operator to control the machine under the intended operating conditions. The seat and its suspension shall be so designed to reduce vibration transmitted to the operator to the lowest level that can be reasonably achieved.

Seat Belt for operator with reminder shall be provided as per DGMS circular no. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020.

D.4.8.4 Operator's Controls and Indicators:

The controls shall be of suitable design and construction and arranged so that they are able to be operated with ease from the operator's seat and within the operator's force limits. Controls shall be laid out and designed to allow easy and safe operation based on the principle that a given direction of movement of any control produces a consistent and expected effect. The surfaces of frequently used pedals shall be fitted with skid resistant type materials.

Controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk — particularly while the operator is getting into or out of the operator's station. The deactivation device shall either be self-acting or shall act by compulsory actuation of the relevant device.

D.4.8.5 Starting and Stopping System:

Grader shall be equipped with a starting and stopping device (e.g., key). The starting system shall have a provision for protection against unauthorized use.

The starting and Stopping system shall be designed such that movement of the machine, shall not be possible, while starting or stopping the engine, without activating the controls. (e.g., Transmission Neutral-Engine Start safety arrangement)

D.4.9 Steering

Suitable steering mechanism is to be provided.

D.4.10 Track Drive System:

All tracks should be suitably hydraulic driven. Speed in milling gear and travel gear are to be on infinitely variable type from zero to maximum speed. A suitable system shall be provided, to ensure uniform traction. The rate of advance should be capable of adjustment from the operator's control station.

D.4.11 Milling Drum:

The Drum should be capable of operating in up-milling direction or, alternatively, in down-cutting direction according to the construction style of the machine. Suitable Tool holders accommodating the cutting tools are to be provided on the body of the drum.

D.4.12 Tool change:

Easy access to the milling drum for tool changes should be provided. In case any scraper blade or drum protection is there and the same does not allow easy access to the milling drum for tools changes, then it should be enabled to be opened hydraulically.

D.4.13 Drum Drive:

The milling drum is to be driven mechanically or hydraulically.

In case of mechanical drum drive, power is transmitted to the drum gear reducer from the diesel engine via a mechanical clutch and power bands. The power bands are tensioned automatically via a hydraulic cylinder.

In case of hydraulic drum drive, power is transmitted to the mechanical digging drive of the drum from the diesel engine via a hydraulic transmission (pumps and motors).

D.4.14 Milling Depth Control:

The surface miner should be equipped with suitable depth control device.

D.4.15 Hydraulic system:
Suitable Hydraulic System is to be provided.

D.4.16 Tank filling system:
Suitable arrangement for filling water, diesel and other fluids are to be provided.

D.4.17 Gauges and Indicators:
The following shall be provided as a minimum:
a. Engine Coolant temperature gauge / indicator
b. Engine oil temperature and pressure gauge/indicator
c. Fuel capacity gauge
d. Engine tachometer / speedometer
e. Engine hour-meter
f. Operating parameter & diagnostic code display including low level of Engine/ PTO & Hydraulic oil level
g. Air pressure gauge (if applicable)
h. Provision for alarm to prevent Hydraulic and PTO / Transmission oil loss.
In case any of these gauge(s) is/are not provided, then it may be adequately explained that how job of the same shall be accomplished in the offered product.

D.4.18 Warning Alarms/Lights:
The following audio/visual warning alarms shall be provided:
a. DGMS approved Audio-visual alarm while reversing. In case the equipment offered/supplied does not have DGMS approved Audio-Visual Alarm while Reversing, then the bidder shall have to submit a scanned copy of a self- declaration that the approval for the same will be obtained from DGMS within a reasonable period but not exceeding one year from the accepted date of commissioning of the equipment.
b. Horn
c. Low Engine Oil Pressure
d. Low Coolant Level
e. High Coolant Temperature
f. Hydraulic Filter Clogging (contamination) indicator
g. Air cleaner restriction
h. Automatic lubrication
i. Fuel level
j. Hydraulic oil temperature
k. P.T.O. lubrication (if applicable)
l. Hydraulic oil level (If applicable)
m. Brake Indicator light

D.4.19 Electrical system:
24-volt system with suitably rated 3 phase alternator and sufficient numbers of 12-volt high capacity maintenance free (Zero Maintenance i.e. completely sealed and no top up required during the course of battery life) batteries, suitably rated starter, socket outlet for electric power, horn and complete set of working and safety lights. All electrical connectors shall be sealed to suppress entry of dust and moisture.

D.4.20 Dust Suppression system
Suitable dust suppression system in order to reduce the dust and powder during operation

of the offered Surface Miner. Such dust suppression should be done through suitable water spraying arrangement to control the dust and fines generated during operation to mitigate the air pollution. Interlocking arrangement of dust suppression system with drum rotation in case of low or zero level of water in water tank is to be provided.

D.4.21 **AUTO FIRE DETECTION AND SUPPRESSION SYSTEM**

A suitable automatic fire detection and suppression system of reputed manufacturer (indigenous or imported), shall be provided on the equipment complying Clause-5 of DGMS (Tech) Circular No. 06 of 2020 dated 27.02.2020.

- Automatic fire detection and suppression system suitable for fire class A, B & C shall be provided in the fire prone zone of the equipment .
- Bidder requires submitting a schematic drawing indicating Plan of the system with relative position of items to be protected from fire.
- Fire detection and suppression of fire may be either total gas flooding or dry chemical powder base spray through nozzle strategically through an actuation cartridge, located to the targets, or combination of the two.
- Fire suppression agent used in neighborhood of electrical appliances shall be clean and shall not damage electrical / electronic component.
- Fire suppression system shall be non-hazardous & safe for human and environment friendly. It should have quick cleanup and environmental sustainability.
- The sensor shall send the signal to the control unit integrated with a LED and/or alarm indicator to show the status of the detector.
- The system shall operate to supply adequate quantity of fire suppressing agent for effective firefighting and to avoid re-ignition and suitably designed to extinguish the fire as per class of fire (A, B & C) of that location. The System shall operate only in active fire area.
- The system shall be actuated automatically by detection of fire and control unit to be installed within the Operator's cabin for automatic system operation.
- The system shall also have provision of actuating manually.
- The system shall provide facility for self-checking /testing/inspection without operating.
- The system should be capable for efficient operation in the extreme mining conditions with dust, dirt, water & vibrations.

The high pressure storage vessels and hoses, if used with fire- fighting and fire suppression systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for AFDSS including materials and chemicals used in fire suppression system from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS (Approval) Circular No. 02 dated 08th July 2013.

Note: Periodical refilling and maintenance shall be done by the supplier during the contract period

D.4.22 Hydraulic Hoses

All hydraulic hoses shall be suitably grouped and clamped to avoid damage from

vibration. Hydraulic hoses in the hot zone shall be fire / heat resistant or retarded type.

D.4.23 Fire Extinguishers

An adequate number of fire extinguishers shall be provided at all strategic points on the equipment, suitably mounted in heavy duty brackets for ease of removal. The extinguishers shall be dry powder (cartridge type) with a minimum capacity of 5 kg and shall comply with Indian Standard IS: 15683.

All material used in the fire-fighting systems shall be non-toxic and in no manner harmful to human beings during handling and use.

The high pressure storage vessels and hoses, if used with fire- fighting systems, shall conform to the requirements stipulated in the relevant Indian standards.

Bidder shall submit a Certificate as an undertaking that, a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Materials and Chemicals to be used in fire extinguisher duly tested from any Government or Government approved Laboratory in compliance with relevant Indian Standards as per DGMS Circular No. DGMS (Approval) Circular No. 02 dated 08th July 2013.

C.4.24 Lubrication System:

A centralized automatic lubrication system of positive pressure type shall be provided, with warning alarms for identification of failed lubrication points on the equipment, except where use of high viscosity lubricants prevent the application of pumped systems, Guide Column and Track Pin.

The lubrication system shall be fully monitored to ensure adequate lubricant flow is maintained to all major parts The monitoring system shall, wherever necessary, be interlocked with the relevant control circuits to prevent damage due to lack of lubrication at any point. Alarms and indications of the failure of lubrication system shall be repeated on the instrument/ test panel (specified elsewhere).

Lubricant containers shall be located inside the machinery house and be large enough to cater for a minimum of 100 (one hundred) hours continuous operation. The containers shall be fitted with suitable cleaning arrangement.

All lubrication lines shall be protected from damage and all injectors shall be in gang blocks at points convenient for visual inspection. The lubrication lines should be properly guided. Flexible lines shall only be used where there is relative movement between parts and for final connection to movable components. Steel piping shall be used for long runs and shall terminate in steel junction blocks to prevent disturbance to steel piping when flexible hoses are replaced.

Lubricants used shall be preferably of reputed Indian make.

D.4.25 Safety Requirements

All safety features & devices as per Govt. Of India Gazette notification no. Z 20045/01/2018/S&T (HQ) dated 01.10.2018, DGMS Circular No. DGMS (Tech) Circular No. 06 of 2020 Dhanbad dated 27.02.2020 and subsequent amendments, if any, including following shall be provided in the equipment. Bidder shall submit a Certificate as an undertaking in this regard that all safety features and devices applicable for the subject equipment are incorporated in the equipment.

The following safety features shall be provided in the equipment

r. All function cut off switch

s. Hydraulic oil and air filter clogging indicator.
t. Fire resistant / fire retarder hydraulic hoses in place of ordinary hoses to reduce the chances of fire. All the sleeves and conduits in which cable/wire are laid shall be of fire resistant type.
u. Seat belt & Seat belt reminder- Should comply as per requirement of Clause 10 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
v. Rear Vision Camera - Should comply as per requirement of Clause -1 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
w. Warning System for Operator Fatigue - Should comply as per requirement of Clause-2 of DGMS Circular no: 06 of 2020 Dhanbad dated: 27.02.2020
x. Mirrors, right and left
y. Hot zones shall be separated from cold zone by providing baffle plate.
z. Exhaust pipes and turbocharger shall be adequately guarded.
aa. Vent valve on top of Hydraulic Tank should be able to be removed without any tool.
bb. Blind spot mirror
cc. Turbocharger guard
dd. Suitable protection guard / device for windscreen / windshield of Operator's cabin.
ee. Retro Reflective Reflectors on all sides for visibility of surface miner during night

C.4.26 ***Productivity & Health monitoring system:***

The equipment shall be provided with suitable licensed, on-line, real time, monitoring interface facility, compatible for GPS-based transfer of equipment performance data (commonly known as PMS and HMS) to third party equipment management system.

The system shall have OBD Self-diagnostic & error alarm features and should capture the parameters of HMS module and other parameters not covered by HMS of the equipment to monitor the following minimum items:

I. Working hour, idle hour, based on the duration of a shift for which the equipment is switched on for operation
II. Engine oil pressure
III. Coolant temperature
IV. Coolant level
V. Engine RPM
VI. Fuel level and fuel consumption rate
VII. Hyd. oil temperature
VIII. Hyd. Oil Level in the tank
IX. Engine electrical system - Battery voltage and Alternator out put
X. All vital parameters of Hydraulic System

This system shall have suitable memory capacity to store above measured data in batch form for at least one month period and shall have suitable port to download these data to a laptop / data storage system.

Alert audio messages to be given to Shovel Operators and control room person for Fire warning to operator and to control room in case of catching fire.

The supplier shall provide the following:

1. There has to be one integrated single online port for capturing all the vital data.
2. The real time interface telemetry port will be provided in the equipment

3. All the data shall be available in the individual form through single port and its communication protocol must be as per global standards.
4. There shall be no additional requirement of any data converter for data capturing like Analog to Digital and vice-versa etc.
5. There shall be integrated on board data management system as explained at point no.3 as above.
6. Permission to third party for interfacing, data collection through online port.
7. Signing of Non-disclosure agreement to protect intellectual property right on either side.
8. To provide full technical support to third party vendor for interpretation and defining parameters for individual alarm to monitor equipment vital data.
9. The HEMM equipment supplier should provide access to data as required by end user without any financial implication to third party.

This interface facility shall be made available till the working life of equipment. However, the supplier shall provide this interface facility during the contract period as a part of contract cost.

To ensure the satisfactory operation of above system, a tripartite agreement shall be signed by the user, supplier and the service provider of OITDS / System Integrator.

D.5 Performance Guarantee

In accordance with the provisions of clause C 6.2.6 of the technical specifications the expected working hours per annum are 5000 **(Four thousand five hundred)** hours. The expected working hours per annum as indicated are only approximate hours and may vary +/- 500 hours.

In accordance with the provisions of clauses C 7.2.2 and C 7.3.2 of the technical specifications the supplier shall guarantee that the availability of each equipment shall be not less than 85% (eighty-five percent) annually for a period of 36 months from the date of accepted date of commissioning and 80% (eighty percent) annually for following 48 months.

D.6. Special Guarantees

The following special assemblies and sub-assemblies must perform / achieve the minimum performance level as detailed below from the date of commissioning of equipment. :

g. **Body, Chassis and differential:** 10000 hours from the date of commissioning
h. **Complete engine system: 8000 working** hours from the date of commissioning
i. **Transmission: 8000 working** hours from the date of commissioning
j. **Track Chain Assy: 8000 working** hours from the date of commissioning
k. **Milling / Cutting Drum: 8000 working** hours from the date of commissioning

In case of failure of any of the above component within the special guarantee period, the supplier shall replace the same with a new one. However, in case of failure of any peripheral item of Engine and transmission e.g., fuel pump/ turbocharger/ water pump / transmission pump etc. within the special guarantee period shall not be treated as failure of engine and transmission but the failed item is to be replaced with new assy. and should work up to completion of the special warranty period. No repair of such components or use of spares supplied against Clause: C6.2 shall be allowed within the special guarantee period.

However, spares supplied against Clause: C6.2 can be used for repair/replacement of

above assemblies after attaining above mentioned special guarantee period as indicated against individual item.

In any case liability of manufacturer / supplier shall be limited for entire contract period from the accepted date of commissioning.

C.7 Expected life of major assemblies

The supplier shall state the expected life in working hours of the following major assemblies. The bidder has to indicate the values in working hours against each item.-.

a. Main Frame
b. Engines
c. Transmission
d. Final Drive
e. Steering System
f. Track Chain Assy.
g. Milling / Cutting Drum

Note - * Expected life means life before first overhaul

D.8. Equipment Acceptance

The equipment ordered will be finally accepted subject to the bidder demonstrating to the purchaser or its authorized representative (may be third party) that the equipment, or assembly or sub-assembly (selected at random) by the purchaser when tested as indicated below, meets the performance data provided by the supplier in accordance with requirements of clause C.8.2. In case if testing facility for a particular parameter is not available at site, the Equipment ordered will finally be accepted subject to submission of Manufacturers Certified test copy for that parameter of performance data provided by the supplier in accordance with requirements of clause C.8.2. A detrimental deviation of up to 2½% will be accepted.

a. Engine Net-Power & RPM: To be tested at works or Equipment Manufacturer Test Data / Report should be submitted.

D.9 Information to be provided by the supplier:

D.9 Dimensions, Weights and Performance Details - The bidder has to submit the values / details against following clause for offered equipment

D.9.1	**Dimensions**
	a. Maximum overall length with and without drum (mm).
	b. Maximum overall width, with and without drum. (mm)
	c. Maximum overall height (mm).
D.9.2	**Machine Weights**
	a. Shipping weight of individual components.(Kg)
	b. Operating weight. (Kg)
D.9.3	**Engine**
	oo.Manufacturer and model
	pp.Number of cylinders
	qq.Bore (in mm)

	rr. Stroke (in mm)
	ss. Displacement (in Liter)
	tt. net power (max^m) at ..... r / min as per ISO 9249
	uu. Maximum torque at .....r / min as per ISO 9249
	vv. ECM make, version and features
	ww. Model year
	xx. Specific Fuel Consumption (SFC) as per Engine Performance Curve complying with ISO:9249 (gm/ kw-hr)
D.9.4	**Final Drive** :
	k. Type & Make
	l. ratio
D.9.5	**Steering & Braking**
	i. Make & Type
	j. Emergency steer method
D.9.6	**Undercarriage**
	a. Undercarriage overall length and width (mm)
	b. Crawler track height (mm)
	c. Crawler effective length(mm)
	d. Crawler effective width (mm)
	e. Crawler shoes, total number
D.9.7	**Electrical System**
	u. Starter make , model and rating
	v. Starter control make and model
	w. Alternator make , model and rating
	x. Batteries numbers , Make and rating (Ah & CCA)
	y. Lighting details
D.9.8	**Hydraulic System**
	a. Make & Model of Pumps
	b. Type of Pumps
	c. Number of Pumps
	d. Flow rate of Pumps
	e. Operating pressures of Pumps
	f. Make & Model of Cylinders
	g. Number of Cylinders
	h. Piston Diameters of Cylinders

	i. Stroke Length of Cylinders
	j. Make & Model of Motors
	k. Numbers of Motors
	l. Rating of Motors
	m. Relief valve operating pressures (kPa)
	n. Operating pressures of all systems (kPa)
D.9.9	**General**
	a. Details, number and location of fire extinguishers
	b. Make, Model and Operating range of all gauges/ indicators
	c. Make, Model of all warning alarms

List of Document:

1.	List of tools covered in Comprehensive tool kit along with quantity required for general Maintenance and repair.
2	List of Special Tools if required for erection and commissioning of Equipment.
3	A Self certificate to the effect that any other tool if required over and above the list of comprehensive tool kit and special tool, shall be supplied by the bidder at no cost to purchaser during the contract period
4	A self-certificate to the effect that the offered equipment will work and perform satisfactorily in the Geographical and climatic conditions as mentioned in CLAUSE No. C.1.
5	Details of major bought-out items including Air-Conditioner etc indicating manufacturer name with their complete address.
6	Self-Certificate with respect to all major components other than items identified / mentioned in Major bought out items list are manufactured by the bidder in their works exclusively.
7	List of Spare parts & Consumables including refrigerant, coolant, lubricants & Greases (per equipment wise per year wise), required for operation of Surface Miner during warranty period.
8	Schedule of use of all necessary lubricants, coolant greases etc. for the operation and maintenance of the equipment, estimated annual consumption and appropriate international standard / brand name or the brand name and reference number of equivalents available in India.
9	Details of Schedule of Maintenance indicating time required for accomplishing each of the maintenance task.
10	Quality Assurance Plan for various stages of manufacture.
11	Copy of valid certificate, valid as on date of opening of tender substantiating compliance with an internationally recognized Quality Assurance Standard.
13	To upload an undertaking to maintain after sales service throughout the life of equipment.

14	Detailed Scope of Specification for Surface Miners with drum width not less than 3800 mm.
15	Detailed description of Engine provided with offered Surface Miner.
16	Calculation showing Sufficiency of capacity of Fuel Tank in respect of fuel consumption.
17	Details with location of Gauges & Indicators.
18	Details with location of Warning Alarms/Lights.
19	Lighting details showing quantity, wattage and other details of lights provided in offered model of equipment.
20	**Fire Extinguisher:** Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along with other documents, for Material and Chemical used in fire extinguisher duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
21	**AUTO FIRE DETECTION AND SUPPRESSION SYSTEM:** Undertaking to the effect that a valid Test Certificate (valid as on the date of commissioning of the equipment at site) shall be submitted at the time of supply of equipment along-with other documents, for Material and Chemical used in fire suppression system duly tested from any government or government approved laboratory in compliance with relevant Indian Standards as per DGMS circular no.2 dated: 08th July 2013 (DGMS Approval).
22	**In respect of Audio Visual Reversing Alarm** -The bidder will submit an undertaking for Compliance of Design, Specification, marking and conformity to the prescribed standards indicated in the letter no. DGMS (Approval)/AVA/01 Dt.25.05.2010 of DGMS, Dhanbad. And also confirm acceptance of stipulations in respect of inspection and maintenance of this letter.
23	Detailed description of Equipment Health Monitoring System with Data Logging Units provided with offered Surface Miner, if applicable.
24	Bidder is to upload authenticated scanned document of expected life in terms of working hours of the major assemblies as detailed in Technical Specification.
25	List of number of offered model and similar equipment supplied during last 05 years in the format given in TECH CLAUSE No. C.8.1.a of Technical specification i.e. "Annexure B"
26	Details of nearest Depot / warehouse and service facilities given in the format given in technical specification (Annexure B) under heading TECH CLAUSE C.8.1.b
27	Details of erection program for the bid.
28	Latest engine performance curves showing net power, net torque and specific fuel consumption of the installed engine, measured according to ISO: 9249. Engine Performance curve must indicate model of the offered Surface Miner & engine.
29	Detailed technical descriptions and specifications of each system of the offered Surface Miner.
30	Layout drawings and detailed technical descriptions of all hydraulic systems and components.
31	Comprehensive commercial literature indicating therein complete technical specifications of the offered model of equipment, the content of which must comply with relevant ISO.

32	Detailed list of instrumentation, monitoring and alarm systems..
33	Detailed technical description of Electronic Control Module used, Diagnostic Tools features, and Equipment Health Monitoring System, if applicable
34	Bidder is to upload authenticated scanned documents of Schematic and layout drawings with details of the Supplier, number, function and type of Automatic fire detection and suppression System.
35	Detailed description with Schematic drawings of Automatic Lubrication System indicating the details of the supplier, number, type and its function.
36	To upload authenticated scanned documents chronologically and in tabular form of " General Information, Dimension, Weight and Performance Details" as mentioned in TECH CLAUSE C.8.3 and all its sub-clauses (D.8.3.1 to D.8.3.9)
37	Confirmation of bidder in respect of supply of equipment fitted with DGMS approved Dust Control system along with DGMS approval certificate. In case, the bidder do not possess such approval at the time of bid submission, then the bidder is to give a declaration to the effect that such approval shall be taken prior to execution of supply in the event of finalization of contract and the supplied Surface Miner shall be fitted with such approved dust prevention and suppression system. However, obtaining such approval or any other issue related to this clause shall not affect Liquidated damages or any clause related Delivery terms of NIT.
38	To upload an undertaking that the offered equipment shall complies all the safety provision and devices as per the Gazette Notification 2018 as well as DGMS Circular 06 Dated 27.02.2020.

- **FORMAT FOR PAST SUPPLY**

Company / User Mine Name	**Mine Name & its type where the equipment is deployed**	**Complete Address of Company / user mine**	**Contract No. and Date**	**Phone no.* / Mobile No.***	**Fax No*.**	**E-Mail ID***	**Name of contact person**	**Sl. No. of machines**	**Model**	**Commissioning Date**

*Should be recent and active for getting information during tendering process and afterwards.

- **FORMAT FOR DEPOT / WARE HOUSE**

Major Depot / Warehouse			Service Facility		
Location with complete address	**Contact Nos.**	**Inventory Value (Approx.)**	**Location with complete address**	**Type of facility available**	**No. of Engineers***

***Engineers / Technicians employed to service the equipment either at the facility or on-site.**

- **TRAINING NEED**

Type of Personals	**At Site**	
	Minimum No. of Personals on Each equipment basis	**Period (For each Personal)**
Engineer	01	02 weeks
Supervisor	02	02 weeks
Fitter/Electrician	03	02 weeks
Operator	Minimum 03 Nos	02 weeks