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**VOLUME – II**  
  
**SECTION – 2.0**  
  
**BASIC BID WORK**  
  
**FOR**  
  
**WHRU REPLACEMENT PROJECT**




**OIL AND NATURAL GAS CORPORATION LIMITED**  
**INDIA**

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## 1.0 DESCRIPTION OF WORK

This section defines, in general terms, the major components of the facilities, which will form, among other things, the Contractor's Scope of Work. The following sub-sections give a general description of the major components of the facilities envisaged under this project.

Section 2.1 of this document covers the survey requirements for platform structure locations and top-side modifications.

Section 2.2 of this document covers the overall description of facilities envisaged under this project spanning across offshore installations of ONGC (wherever applicable and miscellaneous facilities as envisaged under scope of work).


Section 2.3 of this document covers the detailed functional description of the facilities envisaged in this project.

## 2.1 SURVEY REQUIREMENT

In addition to the Survey Requirements indicated in General Conditions of Contract (GCC), Volume-I of bid documents, Contractor shall be fully responsible for carrying out all the pre-engineering (except soil investigation), pre-construction and post-construction surveys for platform locations and also the top-side modifications on the existing platforms. However, the Contractor shall confirm all environmental & geotechnical data before the detailed design and shall be responsible for the interpretation of the data and finalization of the accurate water depth and sea bed features etc. and following jobs:

- Determination of the accurate positioning of all process complexes and wellhead platforms relevant to this project.
- Identification of conditions on the seabed, if required and relevant to the facilities envisaged in this project, with relation to pipelines and composite cables that exist now or which may exist at the time of Installation.
- Determination and confirmation of the accuracy of as-built data including different elevation supplied by the Company. Modify those data as appropriate.
- CONTRACTOR shall visit the process complexes and wellhead platforms, carryout pre engineering survey of the existing facilities to verify the hook up points / routing of the lines through the bridge, wherever as-built drawings of existing facilities are not available.
- CONTRACTOR shall develop the existing drawings relevant for the intended modifications to as built status for the detailed engineering. Special attention shall be given to minimize the shut down time required at each platform and safety for executing the modifications.
- Contractor shall provide copies of all survey reports to the Company.

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## 2.2 FUNCTIONAL DESCRIPTION

The works shall include but not be limited to the following:

| S/N | Asset | Complex | Platform | Equipment                    | Tag No. | Nature of Work | P&ID No.        |
|-----|-------|---------|----------|------------------------------|---------|----------------|-----------------|
| 1   | MH    | IC      | ICP      | WHRU                         | E-2810  | Replacement    | ICP-20-131      |
| 2   | MH    | IC      | ICP      | WHRU                         | E-2820  | Replacement    | ICP-20-131      |
| 3   | MH    | IC      | ICP      | WHRU                         | E-2830  | Replacement    | ICP-20-131      |
| 4   | MH    | SH      | SHQ      | WHRU                         | E-1710  | Replacement    | SH-010-046A     |
| 5   | MH    | SH      | SHQ      | WHRU                         | E-1720  | Replacement    | SH-010-046B     |
| 6   | MH    | SH      | SHQ      | WHRU                         | E-1730  | Replacement    | SH-010-046B     |
| 7   | MH    | SH      | SHQ      | WHRU                         | E-1740  | Replacement    | SH-010-046B     |
| 8   | MH    | IC      | ICPR     | WHRU                         | E-4410  | Replacement    | ICPR-DR-PR-1040 |
| 9   | MH    | IC      | ICP      | Hot Oil Trim Cooler          | E-2880  | Replacement    | ICP-20-131      |
| 10  | MH    | IC      | ICP      | Cooling Water Heat Exchanger | E-3830  | Replacement    | ICP-20-133      |

Any missing data shall be collected by the successful bidder during pre-engineering survey.


## 2.3 DESCRIPTION OF FACILITIES

### 2.3.1 PROCESS

#### 2.3.1.1 WASTE HEAT RECOVERY UNIT – ICP & ICPR

- Removal of existing three WHRUs (E-2810/E-2820/E-2830) and installation of three new WHRUs of the same capacity are to be done at ICP. Removal of existing WHRU (E-4410) and installation of a new WHRU of the same capacity are to be done at ICPR. The new WHRUs are to be within weight and dimensional constraints of existing units. Replacement of the units to be taken up one by one such that process heating requirements are not affected.
- 4 no. of WHRUs (E-2810/E-2820/E-2830/E4410) along with their bypass ducts shall be replaced. Provision for flue gas sampling at accessible location to be provided with the new WHRUs.


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- iii. Respective dampers (HCV-2811, HCV-2821, HCV-2831 & HCV-4411) and TCVs (TCV-2814, TCV-2824, TCV-2834 & TCV-4413) shall be included in the replacement scope.
- iv. Replacement of Hot oil line is to be done from inlet flange till NRV, including NRV, as per the marked-up P&ID.
- v. Replacement of line 10"-T-B2-IH-9207/9206/9209 including XSDV 2810,2820,2830.
- vi. All Hook-ups with existing lines shall be in contractor's scope.
- vii. New WHRU to contain all instrumentation and control system as the existing units as a MINIMUM requirement.
- viii. Rerouting of all piping, if required, from existing location to new location shall be under contractor's scope.
- ix. All associated instruments and piping shall also be replaced as per the marked-up P&ID.
- x. Any damage to the duct/insulation/piping during installation of all WHRU shall be refurbished/reinsulated without time and cost implications.
- xi. Maintenance free Dry running Bearings which do not require any lubrication and Linkage rod ends should be used.
- xii. For more details, marked-up P&ID no. ICP-20-131 (for WHRUs of ICP), P&ID no. ICPR-DR-PR-1040 (for WHRU of ICPR) and Annexure-IA & B (for WHRUs of ICP) of Volume-IV to be referred.

#### **2.3.1.2 WASTE HEAT RECOVERY UNIT – SHQ**

- i. Replacement of existing four WHRU (E-1710/E-1720/E-1730/E-1740) along with associated instrumentation and piping are to be done at SHQ platform. The new WHRUs are to be within weight and dimensional constraints of existing units. Replacement of the units to be taken up such that process heating requirements are not affected
- ii. For the 4 no. of WHRU (E-1710/E-1720/E-1730/E-1740), their downstream ducts shall be replaced. Provision for flue gas sampling at accessible location to be provided with the new WHRUs.
- iii. Respective dampers (HCV-1711/HCV-1721/HCV-1731/HCV-1741) and TCVs (TCV-1714/TCV-1724/TCV-1734/TCV-1744) shall be included in the replacement scope.
- iv. Replacement of hot oil line is to be done from downstream of Shutdown valve, till hot oil pumps (i.e., up to the suction flange and from the discharge flange of the pumps), as per the marked-up P&ID.
- v. New WHRU to contain all instrumentation and control system as the existing units as a MINIMUM requirement.
- vi. Any damage to the duct/insulation/piping during installation of all WHRU shall be refurbished/reinsulated by the contractor without time and cost implications.

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vii. For more details, marked-up P&ID no. SH-010-046A, SH-010-046B and Annexure-II to be referred.

#### **2.3.1.3 HOT OIL TRIM COOLER – ICP**

- Removal of existing Trim Cooler (E-2880) and installation of new Trim Cooler of the same capacity is to be done.
- Trim cooler replacement is to be taken from 4" isolation valve downstream of reducer (including line 4"-T-B2-IS-9242) till TCV along with its isolation and bypass valves, as per marked up P&ID.
- One to one replacement of the unit is to be done and new unit is to be within dimensions and weight of existing unit.
- All associated instruments and piping shall also be replaced. Hook-up of new instrumentation with DCS shall be under scope of contractor.
- Supply and installation of 02 nos of fans along with motors, cables and LCPs shall be in the bidder's scope. Motors shall be of 415VAC, 50Hz.
- Tie-in shall be as per marked-up P&ID no. ICP-20-131.
- For more details, Annexure-III of Volume-IV to be referred.


#### **2.3.1.4 COOLING WATER HEAT EXCHANGER – ICP**

- Removal of existing Cooling water cooler (E-3830) and installation of new Cooling water cooler of the same capacity is to be done.
- Flange to flange replacement shall be done for cooling water cooler along with associated instrumentation and piping. Hook-up of existing instrumentation with DCS/UCP shall be under scope of contractor.
- The new unit is to be within dimensions and weight of existing unit.
- Supply and installation of 02 nos of fans along with motors, cables and LCPs shall be in the bidder's scope. Motors shall be of 415VAC, 50Hz.
- Tie-in shall be as per the marked-up P&ID no. ICP-20-133.
- For more details, Annexure-IV of Volume-IV to be referred.

#### **2.3.2 PIPING**

- The piping scope of work envisaged under this tender broadly consists of but not limited to design, supply, fabrication, installation, testing, pre-commissioning and commissioning & other assistance of piping systems, instruments etc. & Submarine Pipelines, Hook-up, modification works at existing platforms as per the Description of Work (Basic Bid Work) and approved P & IDs including interface jobs as indicated elsewhere in the bidding documents.

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- II. The materials, design and workmanship shall conform to relevant codes, piping design criteria & functional specifications contained in the bid package.
- III. The contractor shall develop Equipment Layouts, Safety Equipment Layouts, Piping General Arrangement drawings, Isometrics & Piping support drawings etc. in accordance with piping design criteria, functional specifications, codes and standards, Description of Work (Basic Bid Work), approved P & IDs, recommendations of Safety Studies, Material Handling Studies etc. during project stage and submit the same for review & approval. However, indicative layouts of Platforms are enclosed with the bid for understanding of scope of work.
- IV. Contractor shall make detailed specification and datasheets (including PMS & VMS) for piping and piping specialty items as per process requirements and submit the same for review & approval during detailed engineering.
- V. Corrosion coupons and retrieval tool kit shall be provided as per process requirement and specification attached elsewhere in the bid package.
- VI. Contractor shall be responsible for complete execution of the project as per design criteria, functional specifications, Description of Work (Basic Bid Work), approved/reviewed DCI & MCI documents and approved P&IDs.
- VII. Supply, design, fabrication and installation of pipe supports are in contractor's scope. Contractor shall develop piping support standards and submit the same for review and approval.

Any other work not specifically mentioned above but required for completeness of work as per specification / drawings shall be in contractor's scope.

#### **2.3.2.1 PIPING (MODIFICATION WORKS)**

- I. The entire scope of piping work related to modification works at existing platforms shall be as per the Description of Work (Basic Bid Work) and approved P & IDs.
- II. Equipment layout drawings for existing well/process platforms where new equipment/vessels/facilities are being installed shall be prepared by contractor based on pre-engineering survey. During pre-engineering survey, in case any unforeseen or unidentified structure/ piping/ equipment etc. found to exist at the platform for which installation of new equipment is hindrance, Contractor shall readjust/ relocate the equipment/ piping as part of scope of work under this tender and submit the modified drawing for Company's approval.
- III. It is contractor's responsibility to ascertain exact pipe routing/pipe sizes/rating/MOC/relocation of Equipment/Requirement of deck extension etc. for meeting the requirement of Basic Bid Work and approved P&IDs. Contractor shall conduct


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necessary site surveys to collect as built data/drawings not enclosed in the bid package and ensure that piping/ equipment clears all existing structures, cable trays, instrument racks, nearby supporting structure or any other equipment. Wherever as built drawings are not available, Contractor shall carry out detailed site survey, gather information from existing well platforms, develop the drawings and submit these for Company's review/ approval.

- IV. Contractor shall prepare detailed survey report for complete scope of work including hook-up details and submit the same for approval.
- V. Routing of new lines shall be same as the old one being replaced to the extent possible.
- VI. Contractor shall provide/extend all safety equipment and systems, as required in the areas where new facilities are provided.
- VII. Contractor shall provide deck drains on the extended portions of the platforms and hook it up with existing deck drains.
- VIII. Contractor shall provide necessary material handling provisions for the new facilities.
- IX. Contractor's scope of work shall include modification/ integration as per approved P&IDs and other requirements listed in elsewhere in the Bid Documents. Contractor may be required to open/dismantle/realign/modify any facility or instrument or piping or equipment of the existing facilities. It will be the contractor's responsibility to make good, test and re-commission all such facilities during and after completion of works with minimum period of platform shutdown. Any alternate arrangement/piping required for minimizing shutdown of equipment shall be in the bidder scope. Details of total shutdown required for each modification/integration shall be submitted to company for approval.
- X. Contractor shall perform the necessary modification/ integration work on the basis of actual physical conditions/ data/ parameters found during the site survey. Contractor shall not be entitled to any cost and time compensation on this account.
- XI. Contractor shall also do the necessary patch up insulation work where insulation is opened up during tapping/ tie-in/ hook-up. Contractor shall plan & carry out suitable positive isolation, depressurization, cleaning, purging, flushing, hydro-testing, drying, and painting & removal of temporary supports, scaffolding etc. Contractor shall take all precautions & follow safety procedures to execute the job safely without any operational hazard.
- XII. Contractor shall ensure, before submission of bid offer, that the space allocated for the various facilities for the modification is adequate and satisfactory. In case, any additional space/ facility such as provision of any walkway/operating platform for maintenance and operation of valve etc. are warranted, the contractor shall indicate the same in bid offer and the cost shall be included in the lump sum price.




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- XIII. In case any existing facility is to be relocated or existing piping is to be altered in order to carryout platforms' modifications, Contractor shall execute these changes including testing etc. without any major shut down.
- XIV. Contractor shall modify the support design wherever necessary to finalize the new support without any intervention with the existing facilities. Installation of pipe work, pipe supports, instruments etc. shall be such that existing walkways / escape routes / maintenance access to existing facilities are not encroached.
- XV. If the bid document / P & IDs specially require any existing facility to be altered or reused, the same shall be done by the Contractor after verifying/ checking the condition of existing facility. If whole or any part of it is found to be defective/repairable, contractor shall replace/ repair the same without any extra time and cost.
- XVI. Contactor shall show the existing piping & Equipment on both sides of the new piping in GAD for modification works to ensure easy location of the piping.
- XVII. Contractor shall be responsible to complete the scope of work with minimum shut down. To achieve the objective, contractor shall make arrangement like temporary connection/modification in safe manner so that shut down is reduced to minimum. Arrangement/ Procedure for the same shall be finalized during pre-engineering survey and submit the same for company's approval. Company shall have right to change the proposal made by contractor based on production and availability of the platform.
- XVIII. Contractor to ensure below cellar deck piping routing shall be kept within the platform deck boundary and at the highest elevation to the extent possible.
- XIX. Contractor shall bring out all the possible piping routing option in the pre-engineering survey report.
- XX. Contractor shall collect all the necessary data regarding current ongoing projects from ONGC for intended modification site prior to carrying out the actual pre-engineering survey. This is to avoid interfacing issues prior to modification jobs executions.
- XXI. It is to be noted that drawings of existing platforms to extent available have already been included in the bid document. Any further details/information required to for detail engineering shall be collected by bidder during pre-engineering survey from the respective platform for modification jobs.
- XXII. Contractor to ensure that any modifications for completion of scope of work shall in no way interfere with operating philosophy of the existing platform unless approved otherwise by company.

Note: Equipment layouts shall be provided to the successful bidder, as per the availability.

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### 2.3.3 STRUCTURAL

#### 2.3.3.1 GENERAL


This Scope of Work detailed below shall be read in combination with “Background and General”, of Basic Bid Works, “Structural Design Criteria (sec 3.4)”, General Specification for Material, Fabrication and Installation of Structure”, Functional Specification for Building Module, Specification for Protective Coating and “Scope of Work for other Discipline” of the Bid.

The Scope shall include the structural work for facility / requirements detailed elsewhere in the bidding documents but not limited to following:

- I) Surveys – Pre-engineering, Post-demolition, Pre-construction & Post construction as detailed below at 2.3.3.2.
- II) Design & Engineering in compliance to Structural, Architectural design criteria along with all related functional specifications.
- III) Procurement of various materials.
- IV) Fabrication.
- V) Load-out.
- VI) Transportation.
- VII) Installation.
- VIII) Supply of loose items, if any.
- IX) As built documentation of the project shall be submitted as defined in Bid document.
- X) Mobilization of suitable marine spreads/workboats in line with the bid scope shall be carried out. Contractor shall make all arrangements for personnel accommodation, storage, fit-up etc. at marine spreads.
- XI) Protective arrangement at platforms for safety of the structures, equipment, piping, instruments etc. during execution of work shall be made by Contractor.
- XII) Preparation & submission of detailed installation methodology including the removal procedure of existing facilities for replacement work for Company’s approval.
- XIII) Dismantling of all existing facilities/items to be replaced at offshore platforms shall be under Contractor’s scope. Their Loading on cargo barges, sea fastening, transporting and their disposal in environmentally safe manner to an onshore location arranged by Contractor shall be in Contractor’s scope. All marine spreads required for transportation of dismantled material shall also be in Contractor’s scope. The same shall be done as per scope of work & approved pre-engineering survey report.

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- XIV) Any other detail/ aspect required for preparation of AFC drawings and smooth installation and execution of job.
- XV) Contractor shall prepare detailed layout for construction and/or demolition of various structural elements like tubulars, rolled sections, plates, gratings, chequered plates, deck plates, handrails, etc. along with removal drawings & detailed MTO for each item.
- XVI) All the repairs & refurbishment/replacement works shall be executed as per pre-engineering survey report.
- XVII) Contractor shall procure, fabricate, test, load-out, transport, lift and install all the necessary structural elements as per the enclosed specifications & Structural design criteria.
- XVIII) Contractor shall prepare the modification plans so as to minimize the obstruction to the working facilities.
- XIX) Contractor shall be responsible for all the necessary certifications of lifting aids as per the specifications. Contractor shall provide all the installation aids, consumables, etc.
- XX) Contractor's scope of work shall include all necessary integration, with the existing facilities. Contractor shall carry out extensive site surveys and familiarize himself with the total work scope to be carried out on the existing platforms. Their scope of work shall include verification of data/ drawings of existing facilities before proceeding with detailed engineering/ procurement based on bidding documents. It shall be Contractor's responsibility to assess the total quantum of work to be carried out on the existing platforms and/or temporary extension of existing platform deck if required.
- XXI) Deck strengthening shall be done by the Contractor (wherever required) based on the findings of Local/Global Deck Inplace analysis with updated loads. Replacement of corroded deck members, plates and additional bracing / stiffening, modification, strengthening of deck beams, providing new supporting beams etc., if required based on Deck Local Inplace analysis of the existing deck structures shall be carried out by the Contractor as a part of his firm scope of work. Contractor to submit all such local design & adequacy check report for review and approval of the company.
- XXII) Additional bracing / stiffening, strengthening, modification etc., if required, to the existing structures due to structural loads or due to site conditions and not visualized at the time of engineering but required at site for completion of work, the same shall be incorporated and provided by the Contractor as part of his firm scope of work.
- XXIII) Pipe support &, cable tray supports shall be provided as per multidisciplinary detailed engineering requirements.
- XXIV) Contractor shall carry out fabrication, painting, load-out, sea fastening and transportation of all materials from Contractor's fabrication yard to offshore platforms.

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Materials as required for painting at offshore (if any) shall also be procured, supplied, transported and applied at offshore locations by the Contractor.


- XXV) Contractor shall carry out Modification / dismantling / cutting/ rerouting/ temporary shifting of any existing facilities, structures, piping, cabling, cable trays, and instruments as necessary to overcome obstruction in execution of replacement work and make it good after installation activity. In case any damage is taken place during the modifications work, the Contractor shall repair or replace the same with new equipment/facilities at no cost to the Company. All such works shall be carried out immediately.
- XXVI) Contractor shall provide, supply, install & uninstall all the necessary scaffolding for proper access during pre-engineering surveys, execution the works and post-construction surveys in safe manner at offshore.
- XXVII) Contractor shall prepare & submit the detailed execution methodology for the overall scope of work for Company's approval.
- XXVIII) Contractor shall prepare & submit the detailed installation methodology for the work for COMPANY's approval.
- XXIX) Contractor shall prepare As-Built drawings showing the modifications works performed under the scope of work in existing drawings and obtain COMPANY's approval.
- XXX) All material shall be new and unused.
- XXXI) Apart from the above, everything else required for executing the work in accordance with the Scope of Work and Technical Specifications shall also be in the scope of the Contractor.
- XXXII) Cost of modification /strengthening/ replacement shall be included by contractor in lump-sum quoted price & the same is not to be considered in tonnage adjustment.

### 2.3.3.2 SURVEY

#### 2.3.3.2.1 Pre-engineering Survey

- To study and find feasibility of proposed scope of demolition/ removal and installation –  
To verify the dimensions vis-a-vis feasibility of installation of the new structure/equipment before carrying out detailed engineering and examine the feasibility of addition/replacement of facilities (Equipment / Vessels / Piping), etc. If any kind of obstructions/fouling of members is/are found for the proposed/planned demolition and installations including deck extensions & proposed addition or replacement of equipment / piping the matter shall be brought to Company's notice in the pre-engineering survey report (with feasible solutions and shall be put up for review / approval of Company).

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- To carry out the survey/ measurements considering all demolition & installation aspects related to repair/replacement/strengthening-Verification of member sizes & thickness (using ultrasound method) shall be carried out during pre-engineering survey for all proposed Structural repair & refurbishment/ replacement/extension/ strengthening/ modification, and architectural modifications.
- To verify as-built documents (like elevations, sizes/ wall thickness of relevant structural as well as non-structural members, etc.) and fill the missing data.

#### **2.3.3.2.2 Post-demolition Survey**

Surveys for structural replacement/ strengthening jobs related to replacement of major equipment like WHRU, Hot Oil Trim Cooler etc.:

- To assess corroded status of the primary & secondary structural members, platings, equipment supports/ skids etc. beneath equipment (which are envisaged to be replaced) may not be possible to full extent during pre-engineering survey.
- To collect data such as member size, corroded size & thickness (using ultrasound method) of platings, equipment supports/ skids, primary/ secondary structural members for one-to-one replacement of corroded members/ strengthening of existing members/ providing additional members.
- Verify the dimensions vis-a-vis feasibility of installation of the new structure/equipment and examine the feasibility of addition/replacement of facilities (Equipment / Vessels / Piping), etc.
- Identify obstruction if any for the proposed installations including deck extensions & proposed addition or replacement of Equipment / piping.

#### **2.3.3.2.3 Pre-construction Survey**

Pre-Construction Surveys is to be taken up before installation. Data obtained from Pre-Construction Surveys is to be compared with data obtained during Pre-Engineering Survey and remedial action, if any, is to be taken up.


#### **2.3.3.2.4 Post Construction Survey**

Post Construction Surveys include as-built status of replaced/repared/modified/Installation works.

#### **2.3.3.3 DESCRIPTION OF WORKS**

##### **2.3.3.3.1 Replacement of WHRU, Cooling Water Heat Exchanger & Hot Oil Trim Cooler**

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| Sl. No. | Platform | Description/Details  |
|---------|----------|--|
| 1.      | ICP      | Replacement of existing three <b>WHRU's</b> with three new WHRU's.                                 |
| 2.      | ICP      | Replacement of existing <b>Hot Oil Trim Cooler</b> with new hot oil Trim Cooler.                   |
| 3.      | ICP      | Replacement of existing <b>Cooling Water Heat Exchanger</b> with new Cooling Water Heat Exchanger. |
| 4.      | SHQ      | Replacement of existing four nos. <b>WHRU's</b> with new WHRU's.                                   |
| 5.      | ICPR     | Replacement of existing one nos. <b>WHRU</b> with new WHRU.  |

#Refer multidisciplinary (Process, Mechanical, Piping, Electrical) scope of work for complete scope of work.


#### 2.3.3.3.2 Platform-Wise Matrix of the work to be executed at different platforms

| Sl. No. | Asset | Complex | Platform | Equipment                    | Tag No.       | Nature of Work |
|---------|-------|---------|----------|------------------------------|---------------|----------------|
| 1       | MH    | IC      | ICP      | WHRU                         | <b>E-2810</b> | Replacement    |
| 2       | MH    | IC      | ICP      | WHRU                         | <b>E-2820</b> | Replacement    |
| 3       | MH    | IC      | ICP      | WHRU                         | <b>E-2830</b> | Replacement    |
| 4       | MH    | SH      | SHQ      | WHRU                         | <b>E-1710</b> | Replacement    |
| 5       | MH    | SH      | SHQ      | WHRU                         | <b>E-1720</b> | Replacement    |
| 6       | MH    | SH      | SHQ      | WHRU                         | <b>E-1730</b> | Replacement    |
| 7       | MH    | SH      | SHQ      | WHRU                         | <b>E-1740</b> | Replacement    |
| 8       | MH    | IC      | ICPR     | WHRU                         | <b>E-4410</b> | Replacement    |
| 9       | MH    | IC      | ICP      | Hot Oil Trim Cooler          | <b>E-2880</b> | Replacement    |
| 10      | MH    | IC      | ICP      | Cooling Water Heat Exchanger | <b>E-3830</b> | Replacement    |

Note: For Tag no. please refer to a multi-disciplinary scope.

#### 2.3.3.4 DESCRIPTION OF STRUCTURAL ANALYSIS SCOPE OF WORK IN LINE WITH 2.3.3.3

##### 2.3.3.4.1 Replacement Of WHRU, Cooling Water Heat Exchanger & Hot Oil Trim Cooler

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Structural scope related to above includes replacement/strengthening of Equipment supports and Deck Modification including strengthening based on pre-engineering & post demolition survey of existing Platforms. Deck modification including strengthening are to be firmed up during detail engineering based on pre-engineering survey. Deck local analysis shall be carried out as per structural design criteria for Deck Modifications including strengthening.

The removal and installation philosophy shall be developed and submitted to Company for review. Replacement of Handrail, Plating & Gratings etc. at Piping /Equipment/Process modification areas shall be carried out by the Contractor based on site Survey. Any issues envisaged for the modification works shall be brought to the Company's notice in the pre-engineering survey report and feasible solution shall also be proposed.


After removal of these equipment's, a post demolition survey shall be performed as detailed below:

1. Corroded status of the primary & secondary structural members, platings, equipment supports/ skids etc. beneath equipment (which are envisaged to be replaced) may not be possible to full extent during pre-engineering survey. Pre-engineering survey shall collect enough data for fabrication of equipment supports/ skids, dimensions of platings to be replaced.
2. Post-demolition survey shall be performed (before undertaking structural replacement/strengthening jobs) to collect data such as member size, corroded size & thickness (using ultrasound method) of platings, equipment supports/ skids, primary/ secondary structural members for one-to-one replacement of corroded members/ strengthening of existing members/ providing additional members.
3. However, pre-engineering survey performed (with available as-built documents) shall collect data required for keeping necessary structural members of different sizes in the construction barges for the activities detailed at point no.-2 above.
4. Verify the dimensions vis-a-vis feasibility of installation of the new structure/equipment and examine the feasibility of addition/replacement of facilities (Equipment / Vessels / Piping), etc.
5. Identify obstruction if any for the proposed installations including deck extensions & proposed addition or replacement of Equipment / piping.

Temporary structure and deck extension if required for replacement of equipment like WHRU etc. shall be erected. Local analysis for Deck extension shall be carried out as per structural design criteria.

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Temporary structure shall be dismantled and disposed after successful installation. Their Loading on cargo barges, sea fastening, transporting and their disposal in environmentally safe manner to an onshore location arranged by Contractor shall be in Contractor's scope. Marine spreads required for transportation of dismantled material shall also be in Contractor's scope.

| Sl. No. | Platform | Description/Details  | Remarks   |
|---------|----------|--|---|
| 1.      | ICP      | Replacement of existing three WHRU's with three new WHRU's                                 | Temporary supports may be provided to support bypass system of WHRU.  |
| 2.      | ICP      | Replacement of existing hot oil Trim Cooler with new hot oil Trim Cooler.                  | Temporary supports may be provided to support bypass system of WHRU.  |
| 3.      | ICP      | Replacement of existing Cooling Water Heat Exchanger with new Cooling Water Heat Exchanger | Temporary supports may be provided during Installation.   |
| 4.      | SHQ      | Replacement of existing four nos. WHRU's with new WHRU's                                   | New structure supports extending from deck for 4 no. of bypass exhaust tip need to be provided as provided for heat exchanger exhaust tip. Temporary supports may be provided to support bypass system of WHRU. |
| 5.      | ICPR     | Replacement of existing one WHRU with new WHRU.  | Temporary supports may be provided to support bypass system of WHRU.  |


The replacement of Plating & Gratings at Piping/equipment/Process modification areas of Platform as per the bid scope shall be carried out by the Contractor. The demolition & relocation of facilities wherever required shall be carried out as part of Scope of work. Any Structural Strengthening at any platform due to facilities & modifications as per the scope of work shall be carried out by the Contractor as part of the scope.

### 2.3.4 MECHANICAL

#### 2.3.4.1 INTRODUCTION

The following sub-sections describe the Mechanical works envisaged under WHRU Replacement Project. This section is to be read in conjunction with the Basic bid work of Process, Structural, Electrical, Piping & Instrumentation, Process Design Criteria, Design Criteria of Mechanical Safety & Life Saving Equipment, Indicative P&IDs and Functional Specifications placed in the bid package for the complete assessment of Mechanical/Rotary & Life Saving Equipment scope of work.



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Further it is to be noted that the standard design criteria of “Mechanical, Safety and Lifesaving Equipment” is enclosed in the bid package which covers all equipment of an offshore platform, therefore only the relevant portions of the design criteria as applicable to this project need to be followed. Bidder to note that anything not mentioned here but nevertheless required to make the system safe and complete shall be supplied and executed.

#### **2.3.4.2 SCOPE OF WORK**


The scope of work shall include pre-engineering survey, design, detail engineering, preparation of drawings and documents, sizing, selection and procurement of Mechanical, Safety and Life Saving Equipment, supply of all material, equipment, tools & tackles and fabrication, installation, hook-up, testing, commissioning and handing over of mechanical facilities complete in all respects. Dismantling & removal (for disposal) of old equipment/material is also under contractor’s scope. Interface issues requiring coordination between vendors for equipment’s / packages shall be under contractor’s scope. Mechanical equipment and facilities shall meet the requirements given in the Process Scope of work, Process Design Criteria, Design Criteria of Mechanical Safety & Life Saving Equipment for Well platform, Process platform, Functional specifications etc., specified in the bid package.

Bidder/Contractor’s scope of work shall include but not limited to:

- Pre-engineering Survey
- Dismantling, removal and safe disposal of old unserviceable equipment/material/items
- Design and Detailed engineering
- Preparation of drawings and documents and obtaining approval of same from Company
- Sizing, Selection and Procurement of Mechanical, Safety equipment
- Fabrication and Assembly
- Testing at shop, yard and at offshore as required.
- Transportation and supply of all material and equipment, tools and tackles
- Installation, pre-commissioning, commissioning, testing and handing over of Mechanical facilities (The equipment installed will be taken in line for operation – one at a time by operator with presence & support from vendor/contractor for equipment commissioning)

The description and requirements contained in this section / specification are concise by necessity and cannot include all details. However, it is the responsibility of the contractor to execute the job in accordance with bid specifications, relevant codes / standards /

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recommended practices / regulations / OISD codes and good engineering practices for smooth and successful operation of the platform.

#### 2.3.4.3 EQUIPMETS / PACKAGES


Contractor shall follow description of work / basic bid work in totality, various discipline's design criteria, relevant functional specifications, other respective codes and standards specified / attached with the Bid package and shall carry out design & detail engineering for various equipment envisaged under this project.

All equipment / packages shall be procured as per the specifications attached with the bid package. In case any new specification, not included in the bid package, is required to be generated, the contractor shall prepare the specification and shall submit to Company for approval.

Wherever equal but conflicting requirements arise between this Scope / Specification and the referenced documents, such conflict shall be brought to the attention of the Company in writing.

Contractor shall carry out the following activities for procurement of Equipment / Packages:

- Contractor shall prepare the enquiry specifications / documents for each Equipment / Packages and materials to be purchased including spare parts for erection & commissioning, special tools and tackles and also to provide list of spare parts for one-year normal operation.
- Equipment data sheets (as per relevant API codes, wherever applicable) and as specified in functional specifications shall be submitted for company's review.
- Contractor shall prepare the detailed Purchase Specification for major Equipment / Packages. Contractor shall obtain the approval of Purchase Specification of Equipment / Packages and items from Company / Company's representative before placement of order on Vendors selected by them.
- Contractor shall carry out the detailed design review, checking and approval of equipment engineering and all drawing and technical data from Vendors for equipment and materials, to ensure adequacy and consistency with the design, safety and operability requirements.
- Contractor shall prepare Inspection and Test Plan (ITP), indicating inspection stages wherever required, in accordance with Company provided Inspection Requirement Table (IRT), Functional Specifications, Codes and Standards etc. covering relevant components, complete equipment / systems and submit it for review and approval by the company.
- Contractor shall include all the commissioning spares as required in the equipment vendor's scope. Contractor shall procure the same from the equipment vendors and make

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it available well before commissioning of equipment. In case, any additional spares are consumed during commissioning the same to be provided by the contractor at no additional cost to the Company.


- For all Equipment / Packages, Vendor shall furnish the list of special tools/ tackles required for assembly and maintenance. Such tools / tackles shall be supplied by the vendor and shall form part of firm supply of Contractor. Unless otherwise specified, for multiple identical Equipment's / Packages (2 or more), at least Two (2) sets of special tools and tackles shall be supplied else one set shall be supplied if the number of equipment / packages is one.
- Contractor's scope shall include complete supply, transportation of equipment package from vendor's shop to site, receipt of material at site, handling at site and arrange for storage at site.
- Equipment which are transported by sea shall have sea-worthy packing. The Contractor shall strictly follow the recommended preservation procedures during the period of storage for all equipment.
- Contractor shall carry out the Erection of each Equipment / Packages at the specified location on the properly designed foundation / support as per requirement stated elsewhere in Bid.
- Contractor shall carry out the inter-connections at all interface points such as main process and utility connections.
- Contractor shall ensure the presence of equipment manufacturer's representative at yard and site (offshore platform) for supervision of erection, testing and commissioning for major Equipment/Packages.
- All pressurized cylinders like clean agent cylinders, CO2 cylinders, Nitrogen cylinders etc. shall have PESO approval for refilling in India. All statutory guidelines shall be adhered to in this regard. PESO certificate shall be submitted at the time of detailed engineering to Company.
- Contractor to refer Design Criteria – Mechanical, Safety and Life Saving equipment for various documentation required for information, review and approval.
- Complete package of the Packaged Equipment identified in Mechanical Design Criteria shall be supplied by the vendor and it shall be covered in one PS.

#### **2.3.4.4 MECHANICAL EQUIPMENT**

##### **2.3.4.4.1 Waste Heat Recovery Unit (WHRU)**

The Scope of Work for Vendor / Contractor includes removal of existing old WHRU's along with dampers, actuators and valves, ducts, insulation etc. from downstream of the exhaust silencer of the Gas turbine till end of exhaust stack and replace it with new WHRU's along with dampers, actuators and valves, ducts (including new exhaust stack), insulation etc. for

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satisfactory operation of the complete system. WHRU shall be handed over one by one for replacement.

New WHRU shall be of same configuration limiting within the given space and weight constraint and shall consist of all the instrumentation & control system as per existing unit as a minimum requirement. WHRU shall be designed as per data sheet, ONGC specifications, as built documents etc. Available documents of existing WHRU (Data sheet, GA drawings, dampers data sheet, P&ID etc.) is attached. However, Contractor / vendor shall clearly identify, collect, verify all requisite information during the pre-engineering survey at platform so that there shall not be any ambiguity during the detail engineering stage. Interface issues requiring coordination between vendors of WHRU & OEM of Gas Turbine shall be under contractor's scope.

Vendor shall have final and total responsibility for the process design (i.e. hot oil outlet temperature, pressure drop etc.), Mechanical design (i.e. workmanship, vibrations of tube assembly, fitment, material etc.), utility consumption (i.e. instrument air consumption, electric power consumption etc.), performance of control system including hardware components and weight guarantee of the WHRU furnished.

For further details of WHRU refer Process scope of work, Process Design Criteria, Basic Bid Work, P & ID, Functional Specification for WHRU (FS 5703 rev 2), Design Criteria for Mechanical, Safety and Life Saving Equipment in Volume-III.

**a) IC Complex:**

- **ICP Platform:** Replacement of three (03) nos. WHRUs (E-2810 / E-2820 / E-2830) along with associated instrumentation and piping.


**Existing design parameters on the tube side:**

Inlet temperature: 160 deg C,  
 Outlet temperature: 250 deg C,  
 Operating pressure: 7.0 – 5.7 kg/cm<sup>2</sup>,  
 Total fluid entering: 230 m<sup>3</sup>/hour.

**Existing design parameters on the exhaust gas side:** (Refer above clause for OEM interface)

Inlet Normal temperature: 453 deg C,  
 Allowable Pressure drop: Maximum permissible pressure drop is 250 mm of water.

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Total flow per unit: 248400 kg/hour.

- **ICPR Platform:** Replacement of one (01) no. WHRU (E-4410) along with associated instrumentation and piping.

**Existing design parameters on the tube side:**

Inlet temperature: 107 deg C,

Outlet temperature: 250 deg C,

Operating pressure: 6.0-7.0 kg/cm<sup>2</sup>,

Total fluid entering: 136,056 kg/hour.

**Existing design parameters on the exhaust gas side:** (Refer above clause for OEM interface)

Inlet temperature: 534 deg C,

Allowable Pressure drop: Maximum permissible pressure drop is 150 mm of water.

Total flow per unit: 174,072.4 kg/hour.

The contractor shall provide high temperature insulation for both main and bypass exhaust ducts of all the WHRU.

**b) SH Complex:**

- **SHQ Platform:** Replacement of four (04) no WHRU (E-1710 / E-1720 / E-1730 / E-1740) along with associated instrumentation and piping.

**Existing design parameters on the tube side:**

Inlet temperature: 160 deg C,

Outlet temperature: 250 deg C,

Operating pressure: 4 -6 kg/cm<sup>2</sup>,

Total fluid entering: 103897 kg/hour.


**Existing design parameters on the exhaust gas side:** (Refer above clause for OEM interface)

Inlet temperature: 515.56 deg C,

Allowable Pressure drop: Maximum permissible pressure drop is 250 mm of water.

Total flow per unit (normal): 67784 kg/hour.

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The contractor shall provide high temperature insulation for both main and bypass exhaust ducts of all the WHRU.

#### 2.3.4.4.2 Hot Oil Trim Cooler

**IC Complex: ICP Platform:** Replacement of one (01) no Trim Cooler (E – 2880 along with Motor and Fan) which is part of Hot Oil System. For further details of Trim Cooler refer Process scope of work / Process Design Criteria / Basic Bid Work / P & ID, Functional Specification for Air Cooled Heat Exchanger (FS 5701F rev2) in Volume-III, Design Criteria for Mechanical, Safety and Life Saving Equipment in Volume-II.

#### 2.3.4.4.3 Cooling Water Heat Exchanger

**IC Complex: ICP Platform:** Replacement of one (01) no Cooling Water Heat Exchanger (E – 3830 along with Motor and Fan) which is part of Hot Oil System. For further details of cooling water heat exchanger refer Process scope of work / Process Design Criteria / Basic Bid Work / P & ID, Functional Specification for Air Cooled Heat Exchanger (FS 5701F rev2) in Volume-III, Design Criteria for Mechanical, Safety and Life Saving Equipment in Volume-II.

#### 2.3.4.4.4 Hot Surface Protection

Personnel protection against accidental contact with hot surface shall be provided for equipment's considered for replacement. Bidder to follow FS 2006 in Volume-III.


#### 2.3.4.4.5 Safety Study

Contractor shall engage an internationally reputed third-party agency having expertise in carrying out HAZID and HAZOP study for installation work at platform. The contractor shall comply with the relevant requirement of functional safety Specifications (FS-5102) for the scope of work as defined in the bid package. Any conflicting requirement shall be brought to company's notice and clarification shall be sought. No new life saving equipment is envisaged in the Project.

### 2.3.5 INSTRUMENTATION

The purpose of Instrumentation is to provide a system such that all the required information/ data/ signals in the desired form and location are available and they work for the safe monitoring, control and optimal operation of the process, safety and associated systems. Instrumentation also makes the required information available in the required form at the local control centers, central control room and/ or remote telemetry unit interface, following the

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Scope of Work, Instrumentation Design Criteria and Functional Specifications of the tender document, applicable Codes & Standards etc.

The present Scope of Work (SOW) broadly envisages Engineering, Procurement, Installation/ Erection, Testing/ Calibration and Commissioning of Instrumentation Monitoring & Control Systems for the jobs mentioned below at the existing process & wellhead platforms.

**1. IC Complex:** Replacement of 3 Nos. of Waste Heat Recovery Unit (WHRU) at ICP (E-2810, 2820, 2830), 1 no. of Waste Heat Recovery Unit (WHRU) at ICPR (E-4410), 1 No. of Hot Oil Trim Cooler (E-2880), 1 No. of Cooling Water Heat Exchanger (E-3830) at ICP.

**2. SH Complex:** Replacement of 4 Nos. of WHRU at SHQ (E-1710, 1720, 1730, 1740).

All the replacement and additional jobs described above shall be carried out with replacement/ addition of all associated instrumentation, control systems, hook up and integration with the existing system in addition to new requirement of instrumentation and control to meet the present bid scope and as per new Design Standards.

**Section 2.3.5.1** provides general guidelines.


**Section 2.3.5.2** covers details of brief instrument scope of work.

**Section 2.3.5.3** covers the details of Modifications jobs at associated platforms/ complexes.

#### **2.3.5.1 GENERAL**

1. This Scope of Work shall be read in conjunction with Instrumentation Design Criteria, Instrumentation Functional Specifications, Piping & Instrumentation Diagrams (P&IDs), various General/ Job Specifications, Process Scope of Work and other technical documents enclosed in the bid package.
2. Any sub-system/ facility, or instruments/ equipment/ accessories or any other requirement not specifically mentioned here, but needed to meet the functional/ technical requirements as specified in project bid documents shall also be the part of scope of this document.
3. Contractor's scope of work for instrumentation and control system for all platforms shall include but not limited to:
  - a) Design and Engineering for all Instrumentation including Monitoring, Control and Safety Systems.
  - b) Documentation of Design & Engineering.
  - c) Procurement, Shop testing, Supply and Inspection of all new instruments in tamper proof packages at site installation.




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- d) Laying of cables, wiring and interconnection with the existing/ new local panels or centralized DCS system for local and remote monitoring and control as per process requirement.
- e) Installation, Field Calibration, Testing, Integration and Commissioning.
- f) **IC Complex:** Additional F&G detection, if required, shall be provided and integrated with the existing F&G system.
- SH Complex:** Existing F&G detection system including HC detectors, UV detectors, FSD loop in SHQ WHRU area shall be replaced and integrated with the existing F&G system. HAZID and HAZOP study to be carried out for installation of additional F&G detectors in the WHRU area.
- g) Pre-Engineering Site Survey.
4. Wherever any doubt/ clarification arises between this Scope/ Specification and the referenced documents, same shall be brought to the attention of ONGC in writing. For resolution, unless specified in General Conditions of Contract (GCC), Volume-I of the Bidding Documents, the order of precedence shall be:
- National Statutory Requirements (the Law)
  - Basic Bid Work (Description of Work)
  - Instrumentation Design Criteria
  - Instrumentation Functional Specifications
  - Industry Codes and Standards
5. In general, for potential replacements and for new instrumentation being considered on individual platforms, the existing field instrument and the systems on the respective platforms shall be surveyed and documented in the pre-Engineering Survey Document for review and approval. The instruments then considered in the design and finalized during the detailed engineering shall be selected so as to be compatible with the existing control/monitoring system.
6. Unless otherwise specified, the term instrumentation shall mean Instruments, Control system & Safety Instrumented System along with the applicable accessories, utilities, hook-up materials etc.
7. Any proprietary or non-proprietary sub-system, facility, instruments, equipment, accessories, hardware, software (including any upgradation requirements), Firmware, upgradation, licensing, not specifically mentioned in the scope but are found essential (during any stage of the project such as pre-engineering survey, detailed engineering, P&ID approvals, Safety studies, HAZOP, CHAZOP, HAZID, Commissioning etc.) for project completion , commissioning and making the system fully functional for safe & Normal operation shall be in the Contractor's scope of work and form part of the bid.

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8. During execution of the project, the Contractor shall, at various stages of the project, submit to the Company as a part of his Detailed Engineering, all the drawings and documents for review/ information/ approval as the case may be, incorporating all the scope, design, selection, methodology of installation etc., as detailed elsewhere in the bid document.


#### **2.3.5.2 BRIEF SCOPE OF WORK**

- The instruments and control systems in complete, required for the modifications on the platforms envisaged under this project as shown in the P&IDs and the Scope of Work, shall be under the Contractor's scope of work. Provision of all new instruments, instruments under replacement and control systems connected with the said equipment to be replaced, their hook-up and commissioning shall be in Contractor's scope of work. All Instrumentation items shall be in accordance with the hazardous area classification of the respective location. The scope involves the responsibility of the Contractor to ensure that all Instruments being procured shall be compatible with the existing systems to which they will be connected.
- In general, the work shall be carried out in line with the existing facilities and including, but not limited to following documents enclosed as part of the bid document:
  - Instrumentation Design Criteria.
  - Instrumentation Functional Specifications.
- The activities related to the following but not limited to these only, are to be developed and executed by the Contractor for meeting the requirement of the project description/ Basic Bid Work.
- In general work shall be carried out in line with existing philosophy of operation of the platform.
- The instruments considered in the design and finalized during the detailed engineering shall be selected so as to be compatible with the existing control/ monitoring system. Wherever the existing system is FF (Foundation Fieldbus type) the new instruments shall also be of FF type, and wherever it is HART, the instruments shall be of HART type. Contractor shall ensure this and specified in the Pre-Engineering Survey Report for review and approval.


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6. All required hardware like I/O cards, components etc. and software modification (graphics, logics etc.), required for commissioning of new facilities shall be in the Contractor's scope. In general, applicable to all platforms, wherever spares are available and identified during pre-engineering survey for use in this project, the used spares (I/O Cards, SCADA Cards, etc.,) shall be replenished by Contractor by providing new cards (depending on number of additional I/O counts and as determined by the FS for DCS/ PLC/ IO Modules). The new cards shall be installed and wired as required wherever spare slots are available. Otherwise, it shall be supplied and handed over as loose spares.
7. The Contractor shall supply and install new field instruments, junction boxes, MCT, tubing, fittings, interconnection cables and instrumentation controls including accessories required for replacement in the modification part of the existing process platforms as per the Description of Work-Process, P&IDs, Functional Specifications of various Instrumentation items etc. enclosed in bid. The Contractor shall provide all instrument supports, instrument isolation valves, impulse tubing and other erection material (including tube trays, cable trays, tubing air supply distributors etc.) as required for all new field instruments. All the upcoming new field instruments as per the P&ID shall be integrated with the existing Control and Safety Systems at existing process platforms.
8. Distribution of power supply, loop checking and commissioning of new instruments.
9. Extension/ modification of existing instrument air system for the new instruments as required. Bidder shall calculate the Instrument Air consumption requirement and submit to company for review. Pipe & pipe fittings, tube & tube fittings for instrument air supply distribution to instruments as required shall be supplied by the Bidder.
10. The Contractor shall assist along with Vendor, tools, tackles, utility etc. during commissioning of the various systems envisaged under this project. The Contractor shall be responsible for the smooth operation of the existing systems which have been modified to take care of the scope of this project. The Contractor shall ensure that the normal operation of the existing systems on the relevant platforms is not hampered during and after all modification jobs have been carried out. After successful commissioning of replaced systems, the same shall be integrated with existing system.
11. Providing any other item as well as its associated work to make the system on each existing platform complete and fully operational shall be in the LSTK contractor's scope of work.


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12. Wherever the bid specifies integration of new Instrumentation & Control system with existing instrumentation & control system, SCADA system, any hardware, software, third party software, configuration, additional/ new licensing, OEM assistance etc. required for complete integration of new and existing facilities shall be in the LSTK contractor's scope of work. Contractor shall ensure any integration with the existing control system network without hampering network security by any sort of virus threat.
13. Mandatory spares for all new supplied instruments for all process packaged equipment, mechanical packaged equipment and electrical packaged equipment shall be provided as per clause 3.6.4.8.6 (a) of Instrumentation Design Criteria in Volume-II.
14. All major instruments for package equipment shall be governed by "Instrumentation for packaged equipment" FS-3503. Instruments being replaced on the process lines connected to packaged equipment under present scope shall be procured from ONGC Suggested Vendor List (SVL).
15. The wetted part of the instruments shall be suitable for the intended process/ service.
16. Separate earthing for panels, junction boxes, cable shields etc. shall be provided.
17. Supply of all types of cables such as signal, alarm, control, power supply, earth cable etc. as per bid requirement.
18. Supply of signal barriers, isolators, receiver switches, relays, trip amplifiers etc. for signals being terminated at the control panels.
19. Hook up of field instruments to Distributed Control System (DCS), Emergency Shutdown (ESD) system, Fire & Gas system (FGS) in Control room as per bid requirement and Pre-Engineering Survey Report.
20. The descriptions and requirements contained in this scope of work and specifications attached elsewhere in the bid are concise by necessity and cannot include all details. However, it is the responsibility of the Bidder to execute the job in accordance with the specifications and good engineering practices for smooth and successful operation of the Platforms.


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21. Installation, configuration, hook up, field calibration, testing, loop checking, logic verification, integration and commissioning, SAT (Site Acceptance Test) of complete Instrumentation & control systems.
22. Any associated structural work for installation of instruments and panels shall also be in bidder's scope.
23. Modification and addition of logics and graphic pages in existing DCS, ESD and FGS system as per scope of work requirement shall be in bidder's scope.
24. Supply of MCT Blocks and Frames for control room cable entries, deck penetration etc. is in the scope of supply of the Bidder.
25. Electrical Heat Tracing shall be done for instruments which are coming on electrically heat traced lines.
26. Supply of start-up and commissioning spares along with other consumables for all instrumentation items.
27. Scope shall include procurement, supply, testing and commissioning of all field instruments under replacement/ addition scope such as control valves, safety valves, electronic transmitters, temperature switches, level switches, pressure gauges, temperature gauges, differential pressure gauges, level gauges, orifice plates, flow meters and accessories, junction boxes, local control panel, branch cables, single pair/ multi pair/ multi triad cables, MCT, cable glands, plugs, cable trays and cable tray supports, tubing & fittings and all other accessories required as indicated by the process requirement, P&IDs.
28. The design and selection of these field instruments shall be as per the relevant functional specifications enclosed in the bid document.
29. Logic for monitoring and control instruments shall be built in existing Process Control System and tripping logic shall be built in existing ESD system. In case if Local Control Panel/ Station is supplied by vendor, same shall be suitably interfaced with existing PCS & ESD systems of platforms.

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30. Laying & termination of serial interface cable from field as well as inside control room, if any, required between instruments and control room. Implementation of serial interface links for other foreign devices and system is in bidder's scope.
31. Smart Positioner with position feedback facility (via HART/ compatible protocol) shall be provided for all control valves under replacement along with their cabling to DCS. For all the closed loops, parameters such as SP, PV, OP and VP shall be made available in DCS graphics.
32. Weather protection canopies shall be provided for all field instruments.
33. Installation methods for all field instruments shall maximize ease of maintenance & operation.
34. All existing field instruments, branch cables, cable trays, tube trays, tubing, fittings, junction boxes and other auxiliaries which are under replacement scope shall be dismantled and removed by the contractor. New cable, cable tray, tube tray etc. shall be in the scope of the contractor.
35. OEM's involvement along with necessary Hardware & Software shall be ensured for smooth integration and functioning in case of new panel with the existing panel at Control room, by LSTK contractor.
36. Available existing systems details at various platforms is tabulated below. However, it is bidder's responsibility to finalize the system requirement by quantities and qualities by site visit/ all documents available at site.

| Sl. No. | Platform Name | DCS                     | ESD   | FGS                                  |
|---------|---------------|-------------------------|---|--------------------------------------|
| 1.      | ICP           | Honeywell C200          | Relay logic based                               | Dettronics Card based                |
| 2.      | SHQ           | Honeywell Experion      | Honeywell Fail Safe Controller (FSC)            | Honeywell Fail Safe Controller (FSC) |
| 3.      | NLP           | Honeywell Experion      | Envirotech Controls Inc. (Pneumatic Master SDP) | GE Fanuc 90-70                       |
| 4.      | ICPR          | Honeywell C300 Experion | Honeywell Safety Manager                        | Honeywell Safety Manager             |

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### 2.3.5.3 MODIFICATIONS JOBS AT ASSOCIATED PLATFORMS/ COMPLEXES


#### 2.3.5.3.1 Replacement of WHRU at ICP (3 nos. E-2810, 2820, 2830) & ICPR (1 no. E-4410).

1. All associated field instruments as per marked-up P&IDs and process scope of work to be replaced with new Hart-based instruments. All associated switches shall be replaced with HART based transmitters. All associated monitoring instruments shall be terminated in DCS cabinet and all tripping instruments shall be terminated in Shutdown system. Any hardware software required for integration shall be in contractor's scope of work.
2. Instrument Branch cables and junction boxes of field instruments associated with WHRU shall be replaced with new one.
3. Associated instruments for upcoming WHRU shall be provided as per OEM design.
4. Existing multicore cables should be tested for damage and to be replaced if required.

#### 2.3.5.3.2 Replacement of 4 Nos. WHRU at SHQ (E-1710,1720,1730,1740)

1. All associated field instruments as per marked-up P&IDs and process scope of work to be replaced with new one. It is to be noted that the pressure, temperature and flow switches mentioned in the marked-up P&IDs are pressure, temperature and flow transmitters configured as switches in the Honeywell PSEQ PLC (Honeywell Safety Manager) and Honeywell DCS. The contractor shall provide transmitters as per the existing system and configure them as switches in PSEQ PLC (Honeywell Safety Manager) and DCS. The additional required hardware like I/O cards, signal barriers, isolators etc in PSEQ PLC and software modification shall be in the Contractor's scope.
2. Branch cables of all field instruments associated with WHRU shall be replaced with new ones.
3. The junction boxes of field instruments associated with WHRU shall be replaced with new ones.
4. Associated instruments for upcoming WHRU shall be provided as per OEM design.
5. Existing multicore cable should be tested for damage and to be replaced if required.
6. Existing F&G detection system including HC detectors, UV detectors, FSD loop in SHQ WHRU area shall be replaced and integrated with the existing F&G system. HAZID and HAZOP study to be carried out for installation of additional F&G detectors in the WHRU area.

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### 2.3.5.3.3 Replacement of Hot Oil Trim Cooler (E-2880) & Cooling Water Heat Exchanger (E-3830) at ICP

1. All associated field instruments as per marked-up P&IDs and process scope of work to be replaced with new one.
2. Instrument Branch cables and junction boxes of field instruments associated with hot oil trim cooler and Cooling water heat exchanger shall be replaced with new one.
3. Associated instruments for upcoming Hot oil trim cooler and Cooling water heat exchanger shall be provided as per OEM design.

### 2.3.6 ELECTRICAL

#### 2.3.6.1 DESIGN, ENGINEERING, SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENT & FACILITIES FOR MODIFICATIONS

This section shall be read in conjunction with relevant portions of the bid package, Electrical design criteria and functional specifications attached in the bid package. Bidder shall note that any item not mentioned here but nevertheless required to make the system safe and complete shall also be supplied and executed by the contractor.

All electrical facilities for modification work at existing platforms as per the scope defined in the bid package shall be provided by the Contractor. The scope of works shall include pre-engineering survey, design and engineering, preparation of drawings & documents, sizing, selection and procurement of electrical equipment, transportation & supply of all material & equipment tools & tackles, installation, construction, testing, commissioning and handing over of electrical facilities complete in all respects.


This section defines the Contractor's electrical scope of work for modification work at existing platforms:

#### 2.3.6.2 MODIFICATION AT IC COMPLEX

##### 2.3.6.2.1 Hot Oil Trim Cooler (E-2880) at ICP Platform

The scope of work related to replacement of complete set of trim coolers along with fan and motor is described elsewhere in the bid package. All electrical works including design, engineering, supply, installation and testing for this package are included in the contractor scope of work.

Power supply shall be taken from existing feeder **SWGR-301 Feeder no 1R-1** and **SWGR-301 Feeder no 19F-1** at ICP Platform. Any modification /repair in the feeders is in the scope of the

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contractor. Complete modification of starter modules with new components shall be in the contractor scope of work.

Existing power & control cable shall be replaced with new cables. New cables shall be laid in existing cable trays and MCT. Supply and installation of all accessories i.e., MCT, cable trays, glands & lugs etc. as required are included in Contractor's scope of supply.

Minimum 02 nos. of 200W, 230VAC flame proof LED flood light and 01 no. of 50W, 110VDC flame proof LED critical light shall be supplied and installed at trim cooler area and shall be connected to the existing lighting network.

Trim cooler motors and LCPs shall be suitable for Class I / Division II, Gas Group C, D, Temperature class T3 (as per NEC) or Zone II, Gas group IIA/ IIB, Temperature class T3 (as per IEC), IP65 as a minimum. MOC of trim cooler LCP shall be either FRP or GRP or SS316 material only. LM6 material shall not be allowed to use. Cables used shall be FRLS type only. Two nos of 200W, 230VAC and One no of 50W, 110VDC LED flame proof flood lights shall be supplied and installed at trim cooler area and shall be connected to the existing lighting network.

#### **2.3.6.2.2 Cooling Water Cooler (E-3830) at ICP Platform**

The scope of work related to replacement of cooling water cooler along with fan and motor is described elsewhere in the bid package. All electrical works including design, engineering, supply, installation and testing for this package are included in the contractor scope of work.


Power supply shall be taken from existing feeder **SWGR-302 Feeder no 18R-3** and **SWGR-302 Feeder no 18R-4** at ICP Platform. Any modification /repair in the feeders is in the scope of the contractor. Complete modification of starter modules with new components shall be in the contractor scope of work.

Existing power & control cable shall be replaced with new cables. New cables shall be laid in existing cable trays and MCT. Supply and installation of all accessories i.e., MCT, cable trays, glands & lugs etc. as required are included in Contractor's scope of supply.

Minimum 02 nos. of 200W, 230VAC flame proof LED flood light and 01 no. of 50W, 110VDC flame proof LED critical light shall be supplied and installed at cooling water cooler area and shall be connected to the existing lighting network.

Cooling water cooler motors and LCPs shall be suitable for Class I / Division I, Gas Group C, D, Temperature class T3 (as per NEC) or Zone I, Gas group IIA/ IIB, Temperature class T3 (as per IEC), IP65 as a minimum. MOC of cooling water motor LCP shall be either FRP or SS316 material only. LM6 material shall not be allowed to use. Cables used shall be FRLS type only. Two nos of



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200W, 230VAC and One no of 50W, 110VDC LED flame proof flood lights shall be supplied and installed at cooling water cooler area and shall be connected to the existing lighting network.

#### **2.3.6.2.3 WHRU Area**

Ten nos. of 200W, 230VAC and Five nos. of 50W, 110VDC LED flame proof flood lights shall be supplied and installed at WHRU area and shall be connected to the existing lighting network.

#### **2.3.6.3 MODIFICATION AT SH COMPLEX**

##### **2.3.6.3.1 WHRU Area**

Twenty-five nos. of 175 W, 240 V AC HPMV light fittings and Seven nos. of 100 W, 110 V DC emergency light fittings shall be replaced at WHRU area as per the layout attached at Annexure V.

#### **2.3.6.4 GENERAL**

All associated electrical works related to the package equipment and modification works defined in other sections of bid is included in the contractor's scope of work.

Relocation of any electrical items such as lighting poles, cables, cable trays, junction boxes etc. if required due to carrying out modifications and any additional lighting required due to modification and / or deck extension anywhere at any Platform where modification / deck extension is included in this Scope of Work.

All light fittings supplied shall be suitable for Class I / Division I, Gas Group C, D, Temperature class T3 (as per NEC) or Zone I, Gas group IIA/ IIB, Temperature class T3 (as per IEC), IP65 as a minimum.