



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

TENDER DOCUMENTS

FOR

**HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)**

(VOLUME - I)

CONSULTANTS

August, 2021



Petrochemical Engineering Consultants

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OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - 0)

BACKGROUND AND INTRODUCTION

FOR

HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)
(0504196-BTD-001)

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August, 2021



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1.0 BACKGROUND AND INTRODUCTION

Oil & Gas Development Company Limited (OGDCL) is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to install a reciprocating compressor package and separator packages suitable to operate in remote locality of MARU-1 wellhead / Maru-Reti Gas Field.

Total eight wellheads have been drilled in the area including RETI-1A, RETI-2, MARU-1, MARU-2, MARU-SOUTH, MARU-EAST, KHAMISO and UMAIR-I. Raw gas from the above mentioned wellheads commingle at MARU-1 wellhead.



Company is procuring following equipment / packages, which will be provided by Company as free issue to the PC Contractor, when desired by Company, for installation/field erection/storage by PC Contractor. The details of these equipment / packages are given below:

- Compressor Package
 - Valve Assembly/Pipeline Skid
 - Suction/Discharge Scrubbers Skid
 - Compressor Skid
 - Cooler Skid
 - Generator Skid
- Separator Packages

For Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project, OGDCL intends to engage a PC Contractor to carry out the required Works on complete responsibility basis.

The prospective bidders are required to carefully review the document and send the enclosed letters of Intention to Bid or Declining the Bid and Secrecy declaration two (02) weeks before the bid submission date mentioned in tender notice.

Sealed bids are hereby invited under Single Stage Two (02) Envelope bidding system (i.e. Technical & Financial Bids in separate envelopes) from eligible bidders.

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Both the bids shall be submitted simultaneously in separate sealed inner and outer envelopes. The envelope containing Technical Bid must be marked clearly “Technical Bid” and containing Financial Bid must be marked clearly “Financial Bid” along with indication on the envelopes as “ORIGINAL” and “COPY”.

The PC Contractor shall review/understand/analyze the complete tender document prior to submission of Bid. Upon submission of bid, it shall be considered, as the PC contractor has reviewed all the documents/datasheets/drawings/specifications/lists included in the Tender document herein. The tender document comprises of two (2) volumes as detailed below:

- **Volume – I**

- Section – 0 : Background & Introduction
- Section – I : Invitation to Bid
- Section – II : Instructions to Bidders (ITB)
- Section – III : Scope of Work & Specifications
- Section – IV : Form of Contract
- Section – V : Conditions of Contract

- **Volume – II**

- Volume – 2 A : Supply Material Documents
- Volume – 2 B : Civil Works
- Volume – 2 C : Electrical & Instrumentation Works
- Volume – 2 D : Mechanical Works

The bidders will prepare and submit their bids, as per instructions given in the ITB (**Section-II**) and Scope of Supply & Works along with Specifications attached in **Section-III** of this tender document. The Form and Conditions of the Contract are given in **Section-IV** & **Section-V** while supplementary technical documentation is given in **Volume-II** of Tender Document.

OGDCL has engaged M/s Petrochemical Engineering Consultants (PEC) as Consultant. PEC is responsible for providing design engineering of the project.



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - I)

INVITATION TO BID

FOR

**HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)
(0504196-BTD-002)**

CONSULTANTS

August, 2021



Petrochemical Engineering Consultants

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(To be typed on OGDCL Letter Head)

Date: (of Issuance of Invitation)

Subject: **INVITATION FOR BIDS (IFB), SECTION - I**



Dear Sirs,

The Oil & Gas Development Company Limited (OGDCL), Islamabad, Pakistan intends to install a reciprocating compressor package and separator packages suitable to operate in remote locality of MARU-1 wellhead / Maru-Reti Gas Field. For implementation of the project OGDCL through this Invitation to Bid, invites parties to participate in the Tender for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project, by submitting their bid proposals as per instructions given in Section-II of this Tender Document.

OGDCL is procuring following equipment / packages, which will be provided by OGDCL as free issue to the Contractor, when desired by Company, for the works mentioned in the scope document given in **Section-III** of the document herein. The list of the equipment / packages is given below:

- Compressor Package
 - Valve Assembly/Pipeline Skid
 - Suction/Discharge Scrubbers Skid
 - Compressor Skid
 - Cooler Skid
 - Generator Skid
- Separator Packages

In this connection, sealed bids are hereby invited for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning

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& Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project.

OGDCL has appointed Petrochemical Engineering Consultants (PEC) as Engineering Consultant for providing engineering, project management, procurement assistance and site supervision consultancy services to ensure timely completion of the project complying with technical specifications.

The Tender Document defines the basis for the bid proposals and consists of following Volumes together with any Addenda that may be issued from time to time:

- **Volume – I**

- Section – 0 : Background & Introduction
- Section – I : Invitation to Bid
- Section – II : Instructions to Bidders (ITB)
- Section – III : Scope of Work & Specifications
- Section – IV : Form of Contract
- Section – V : Conditions of Contract



- **Volume – II**

- Volume – 2 A : Supply Material Documents
- Volume – 2 B : Civil Works
- Volume – 2 C : Electrical & Instrumentation Works
- Volume – 2 D : Mechanical Works

1. You are required, within one (1) week of receipt of Tender Notice to execute/send the following, the formats of which are enclosed with this invitation:

- Letter of Intention to Bid or Declining to Bid
- Secrecy declaration
- Proforma for site visit

2. Your offer must be valid for 180 days from the date of technical bid opening.



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3. All bids must be accompanied with a Bid Bond (Bank Guarantee) of an Amount of PKR 03 Million or equivalent to US\$ as detailed below and must be delivered to the OGDCL's office on or before time and date as per press advertisement.
4. Clarification, or any other information, if required can be obtained by addressing Petrochemical Engineering Consultants with C.C. to OGDCL whose addresses are given below:

- a) Project Manager
(Maru-Reti Compression Project)
9th Floor, Tower "A", OGDCL House, Blue Area
Islamabad, Pakistan
Telephone: (92-51) 2623142
E-mail: iftekharaahmed@ogdcl.com
- b) Manager (Supply Chain Management) (Foreign)
Oil and Gas Development Company Limited
OGDCL House, Jinnah Avenue Blue Area
Islamabad, Pakistan
Telephone: (92-51) 920023780
E-mail: ejaz_rizvi@ogdcl.com
- c) Project Manager
(Maru-Reti Compression Project)
Petrochemical Engineering Consultants
C-2, Block No. 17, Gulshan-E-Iqbal,
Karachi-75300, Pakistan.
Telephone: +92 (21) 34827780
Fax No.: +92 (21) 34961089
Email: Adeel@pcec.com.pk,

Note: Information or clarification of the Bidding Documents can be obtained at least two weeks before bid submission date. Thereafter, no clarifications shall be entertained.

5. OGDCL reserves the right to accept or reject any bid or part of a bid and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders.
6. OGDCL reserves the right at the time of award of Contract to increase or decrease the quantities of material specified in the Tender document or give partial order without any change in unit price or other terms and conditions.

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7. Bidders are advised to carefully review and examine the enclosed Tender Documents and site conditions for assessment of work involved. The Tender Documents contains required information necessary for preparation of the Bid. However, it is the sole responsibility of the Bidder to become fully informed about existing and expected conditions that may affect performance of its obligations under the Contract.
8. The Bidder who is formally selected by OGDCL shall be required to enter into Contract with OGDCL, incorporating the provisions stated in this document.
9. The Bids are invited under Single Stage – Two Envelope Bidding Procedure i.e. Technical Bid and Commercial Bid. The Bids are required to be submitted in two separate envelopes sealed and clearly marked as per details given in enclosed Instructions to Bidders.
10. OGDCL does not take any responsibility for collecting the bids from any Agency. Bidder’s authorized representative may attend the Tender opening if desired. The tender received after closing time or date shall be returned to Bidder unopened.
11. Bids will be opened at (as mentioned in the tender notice) hours (PST) at the place noted above.



Kindly acknowledge receipt of the documents by return email/telefax to the under-signed.

Thanking you,

Truly yours,

for OIL & GAS DEVELOPMENT COMPANY LTD.

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Encl.: As above.

(On Bidders Letter Head)

LETTER OF INTENTION TO BID

Oil & Gas Development Company Limited
 1st Floor, OGDCL House, Blue Area,
 Islamabad (Pakistan)

SUBJECT: TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

**FOR THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
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 COMPRESSION PROJECT (PC)**

Dear Sir(s),

We acknowledge receipt of the above mentioned Tender Documents.

We confirm that we shall be submitting our Bid complying with the Tender Documents on intimated Bid submission date.

We are enclosing the duly signed secrecy declaration & proforma for Site Visit.



Yours faithfully

Signature: _____

Name: _____

Designation: _____

Company: _____

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(On Bidders Letter Head)

LETTER OF DECLINING TO BID

Oil & Gas Development Company Limited
 1st Floor, OGDCL House, Blue Area,
 Islamabad (Pakistan)

SUBJECT: TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

**FOR THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
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 COMPRESSION PROJECT (PC)**

Dear Sir(s),

We have obtained the subject tender document and regret that at this instance we shall not be submitting the bid. We are therefore, returning herewith the Tender Documents in full together with duly signed Secrecy Declaration for OGDCL record.



Yours Truly,

Signature: _____

Name: _____

Designation: _____

Company: _____

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SECRECY DECLARATION

Oil & Gas Development Company Limited
1st Floor, OGDCL House,
Jinnah Avenue Islamabad (Pakistan)

SUBJECT: FOR THE SERVICES OF PC CONTRACTOR FOR SUPPLY / INSTALLATION / ERECTION / FABRICATION / CIVIL FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING / COMMISSIONING & START UP ASSISTANCE OF MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI COMPRESSION PROJECT (PC)

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

Dear Sir(s),



We the undersigned _____ having our principal office at _____ (hereinafter referred to as the Bidder) hereby declare to Oil & Gas Development Company Limited, Islamabad - Pakistan (hereinafter referred to as OGDCL) to accept the following terms and conditions on which OGDCL is prepared to communicate to the Bidder Certain Confidential Information as hereinafter defined:

1.0 DEFINITIONS

1.1 “Project” shall mean Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project.

1.2 “Confidential Information” shall mean any knowledge and information in connection with the Project at any time disclosed to the Bidder by or on behalf of the OGDCL in writing, in drawing or in any other form or acquired by the Bidder from the OGDCL, as well as all data derived from such knowledge and information at the time of such disclosure or acquisition is not:

- in the free and lawful possession of the Bidder or
- part of public knowledge or literature.

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1.3 “Confidential Record” shall mean all manuals, specifications, drawings, letters, telexes and any other material containing Confidential Information. For the purpose of Clauses 2 and 5 Confidential Information shall include Confidential Record.

1.4 The Confidential Record shall be such information as may be given by OGDCL.

2.0 CONFIDENTIALITY

2.1 The Bidder

- Shall preserve and cause its employees to preserve the secrecy of all Confidential Information.
- Shall not except with the prior written consent of OGDCL and subject to the conditions contained in Clause 5, for any purpose other than the performance of the contracts for the Project or the preparation and submission of a bid for the Project.
 - i) disclose to any third party or enable any third party to note that fact that the Bidder has been invited to submit a bid for the Project and/or, if applicable, the fact that the Project has been entrusted to the Bidder.
 - ii) reproduce, copy or use, or disclose to, place at the disposal of or use on behalf of any third party or enable any third party to peruse, copy or use, any Confidential Information

2.2 The undertakings under clause 2.1 above shall continue in so far as the Confidential Information in question has not:



- become part of public knowledge or literature, or
- been disclosed to the Bidder by a third party (other than one disclosing on behalf of OGDCL) whose possession of such information is lawful and who is under no secrecy obligation with respect to the same.

3.0 COPYRIGHT

3.1 The copyright in the Confidential Record shall, in the absence of any express provision to the contrary be vested in OGDCL.

4.0 RETURN OF CONFIDENTIAL RECORD

4.1 Upon completion of the Project, or if it is decided that the Project will not be entrusted to the Bidder, upon notification to the Bidder of such decision, the Bidder

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shall return to OGDCL all Confidential Record.

5.0 THIRD PARTY



5.1 The Bidder shall ensure that under the terms of this Secrecy Declaration any of the Confidential Information comes to the knowledge and/or in the possession of any third party, the Bidder shall require from such third party that it shall abide by stipulations equivalent to those contained in this Secrecy Declaration.

Agreed and accepted this _____ day of _____.

Signature: _____

Name: _____

Position: _____

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PROFORMA FOR SITE VISIT

Oil & Gas Development Company Limited
1st Floor, OGDCL House,
Jinnah Avenue Islamabad (Pakistan)

SUBJECT: FOR THE SERVICES OF PC CONTRACTOR FOR SUPPLY / INSTALLATION / ERECTION / FABRICATION / CIVIL FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING / COMMISSIONING & START UP ASSISTANCE OF MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI COMPRESSION PROJECT (PC)

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

Dear Sir(s),

Our following representative(s) will visit Maru-Reti Gas Field on the date to be intimated by OGDCL.

The representative(s) nominated for the visit are:

<u>FULL NAME</u>	<u>NATIONALITY</u>	<u>& CNIC/Passport No./Contact No.</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

We accept that the visit will be coordinated by OGDCL but the arrangements and costs for the visit including Visas, Travel and Accommodation costs will be to our account.

Yours faithfully,

Signature: _____

Position: _____

Enclosures:

- 1) Copy of Valid National Identity Card / Valid Passport
- 2) Three (03) Photographs



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - II)

INTRODUCTIONS TO BIDDERS

FOR

HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
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(0504196-BTD-003)

CONSULTANTS

August, 2021



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1.0 GENERAL



1.1. Project Background and Description

Oil & Gas Development Company Limited (OGDCL), Islamabad, Pakistan is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to install a reciprocating compressor package and separator packages suitable to operate in remote locality of MARU-1 wellhead / Maru-Reti Gas Field for the completion of Maru-Reti Compression Project. For implementation of the project, OGDCL through this Invitation to Bid, invites parties to participate in the Tender for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project by submitting their bid proposals as per instructions given in this Tender Document.

OGDCL intends to engage a PC Contractor to carry out the required Works on complete responsibility basis with due diligence. In this connection, sealed bids are hereby invited for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project, by OGDCL.

OGDCL is procuring following equipment / packages, which will be provided by OGDCL as free issue to the Contractor, when desired by Company, for the works mentioned in the scope document given in Section-III of the document herein. The list of the equipment / packages is given below:

- Compressor Package
 - Valve Assembly/Pipeline Skid
 - Suction/Discharge Scrubbers Skid
 - Compressor Skid
 - Cooler Skid
 - Generator Skid

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- Separators Packages

These instructions to bidders (ITB) define the basis of Bid for but not limited to Procurement (Supply), Construction, Fabrication, Installation/Erection, Pre-Commissioning, Commissioning & Start-up Assistance. The Bidders will prepare and submit their Bids, as per instructions given in this document.

1.2. **Engineering Consultant**

OGDCL has appointed Petrochemical Engineering Consultant (PEC) as Engineering Consultant for providing engineering, procurement assistance and site supervision consultancy services to ensure timely completion of the project complying with technical specifications.



1.3. **OGDCL Responsibilities**

OGDCL shall be responsible for providing the Contractor the following:

- a) Information, engineering data/documents and free issue equipment & materials as stipulated in the Contract Document.
- b) Issue of letters only to the authorities in Pakistan, which Contractor may require for the execution of the Project Works. However, obtaining such permits shall be sole responsibility of the Contractor.
- c) OGDCL shall only provide facilitation letters to the Contractor in obtaining required duty concessions as per SRO. 678 (I)/2004. However, obtaining such concessions and custom clearance shall be sole responsibility of the Contractor.
- d) Review and approvals of documents by OGDCL/Engineering Consultant submitted by the bidder in batches/phases.

1.4. **Completion Time**



The timely completion of the Works by the PC Contractor shall be the essence of the Contract, as OGDCL has to meet its obligations for completion of the Project. Since the execution of the project shall require to be performed in phases, accordingly, the Project i.e. Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor

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package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project shall be completed as per following schedule:

- a) The total duration for the completion of Maru-Reti Compression Project shall be Five (05) Months (04 months for Mechanical completion & 01 month for Pre-commissioning/commissioning). (This includes all weekends, public holidays and the like, PC Contractor shall be responsible to plan all activities and manage the progress accordingly, while taking into account the restrictions of Pandemic/Epidemic lockdowns and the like of which may cause delay in the project completion).
- b) Mobilization within two (02) weeks from the date of establishment of L/C for supply while procurement (supply) of sufficient material to kick-start and maintain sufficient work-fronts for the project within two (02) weeks from the date of establishment of L/C for supply.
- c) Supply & delivery of all material required for the completion of the Maru-Reti Compression Project within 02 months from the date of establishment of L/C for supply.
- d) Completion of all Mechanical, civil, electrical and instrumentation works along with erection/installation of equipment/packages/loose items supplied by OGDCL, to meet the requirements of Mechanical Completion certificate within Four (04) months from the date of establishment of L/C for supply.
- e) One (01) Month for the, Commissioning & Start-up assistance of the Reciprocating-Compressor, the Commissioning & start-up of separator packages and complete civil, electrical, mechanical works shall also be completed within this time period.

Note: The conditions of Liquidated Damages shall apply after four (04) months, the date of establishment of Supply L/C, in accordance with the Clause 28.0 of the Section-V, Conditions of Contract provided in Volume-I of the Tender Document herein. The Total duration of the Mechanical completion shall be (Four (04) months from the date of establishment of L/C for supply) as well as total duration of the Completion of Maru-Reti Compression Project (Five (05) Months). The PC Contractor shall be responsible to expedite/perform the works in such a manner as not

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to affect the project timeline. Any delay in the completion of Maru-Reti Compression Project shall be on the account of PC Contractor.



1.5. **Eligibility Requirements**

Bidders must meet the following eligibility requirements.

- a) The equipment/material to be supplied under the Contract must be brand new and produced in and supplied from the countries maintaining bilateral trade relation with the Islamic Republic of Pakistan. PC Contractor shall provide an undertaking to this effect.
- b) The Bidder and its engineering staff shall meet all the requirements of Pakistan Engineering Council (PEC) Act 1976, its bye-laws and latest amendments and provide documents to OGDCL to this effect.
- c) The Bidder should be registered with Pakistan Engineering Council in C-4 Category or above with applicable specialization codes for Civil (CE10), Mechanical (ME07) and Electrical (EE11). (Bidder to provide copies of valid PEC certificates for confirmation.)
- d) The bidder and its local JV partners shall be registered with Pakistan Engineering Council (PEC) at least in C-4 category in case of Local Bidders, and (PEC) in FC-1 category for international bidders before submission of bid to OGDCL.
- e) The Bidder Company/ firm must have completed at least two (02) Compressor installation projects either in oil & gas Processing Plants Projects (Min 10 MMscfd each) OR One (01) Project of 25 MMscfd Compression Facility (Reciprocating Compressors) OR comparable size projects amounting to PKR 60 Million in Petrochemicals/fertilizers/Power Plants, on Procurement, Construction, Installation Pre-commissioning and Commissioning Basis as PCC Contractor during last Seven (07) years.



Bidder must submit details of such projects/package with relevant client information and documentary evidence for their successful completion. Projects without documentary evidence for successful completion will not be considered. In case of joint venture, the experience of Partner Incharge shall be considered for eligibility based on the responsibility matrix.

- f) Applicant must not be black listed with any agency or organization or/ and applicant has never indulged in corrupt, fraudulent or collusive practices for

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procuring contracts. An affidavit confirming this shall be provided with the proposal. In case of consortium bid all partners need to submit the affidavit separately.

- g) Submission of duly signed and initialed copy of Tender Document along with Appendices, Annexures & Attachments refereed therewith. Signing and stamping shall mean validation and compliance to all the details included in Tender Document.
- h) Completion time of Five (05) months is mandatory requirement, bids submitted with completion time beyond Five (05) months shall not be considered for evaluation.
- i) Bids submitted by a joint venture/consortium of two or more firms as partners shall submit the memorandum of understanding (MOU) duly certified by notary public containing the following mandatory clauses:
 - a. The bid, and in case of a successful bid the Form and Conditions of Contract, shall be signed so as to be legally binding on all partners.
 - b. One of the partner shall be nominated as being Incharge and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners and certified by Notary Public. Only Partner Incharge experience shall be considered for experience requirement as mentioned in point 'd' and 'e' above. Other JV partner(s) shall have experience(s) relevant to the defined responsibility matrix.
 - c. The partner Incharge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture/consortium and the entire execution of the Contract. All the payments shall be made by OGDCL in the name of lead Partner.
 - d. All partners of the joint venture/consortium shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under Clause (b) above as well as in the Form of Bid and the Form and Conditions of Contract (in case of a successful bid).
 - e. A copy of the Memorandum of Understanding (MOU) entered into by the consortium/joint venture Partners broadly, outlining the relationship and

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responsibilities with respect to the Maru-Reti Compression Project shall be submitted with the Bid.

- f. Within fourteen (14) days of issuance of notification of intent to award from OGDCL the successful Bidder shall furnish a copy of Contract entered into by consortium/joint venture partners shall be submitted to OGDCL.

1.6. **Site Visit**

The Bidders are required to visit the Maru-Reti field at their own expense. A written request for site visit shall be submitted by the bidder to OGDCL. The exact date and timing of the visit shall be informed to the bidder by the OGDCL. The visit can be planned within two (02) weeks from the date of the Tender publication. During the visit the Bidders should examine the site and its surroundings. The Bidders should verify the information provided in the Tender Document, assess the requirements and obtain on their own responsibility all information that may be required and is necessary for preparing the Bid and entering into Contract with OGDCL.



The request for visit as per format enclosed with Invitation to Bid should be sent to OGDCL/Engineering Consultant in a timely manner. The cost to be incurred on the visit shall be at Bidder's expense. The Bidder and any of its personnel or Agents/ Consultants will be granted permission by OGDCL to enter upon its facilities for the purpose of such visit, but only upon the express condition that the Bidders, its personnel or Agents/Consultants will release and indemnify OGDCL its personnel Agents/Consultants, from and against all liabilities in respect thereof including personal injury (whether fatal or otherwise) and any other loss, damage, costs and expenses.

1.7. **Cost of Bidding**

- a) The Bidder shall bear all costs associated with the preparation and submission of its bid, and OGDCL will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
- b) The Bidder shall bear all costs of obtaining and submitting Bid Bond, Performance Guarantee and all other documents required as per instructions in the Tender Document.

1.8. **Assurance**



The successful Bidder will be required to give satisfactory assurance of its ability and intention to complete the Procurement (Supply), Construction,

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Fabrication, Installation/Erection, Testing and completion of all Civil, Mechanical, Electrical and Instrumentation works and provide Pre-Commissioning, Commissioning & Startup services for the Project pursuant to the Contract, within the time set forth therein.

1.9. **Pre-Bid Meeting** (If required however not mandatory)

A pre-bid meeting may be held Two (02) weeks prior to bid opening date of the Tender upon formal request from bidders. The venue, date and timing of the meeting will be notified by OGDCL in due course. The Bidders are advised to attend the pre-bid meeting and obtain clarifications and information necessary for preparation of bid document.

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2.0 TENDER DOCUMENT

2.1. Description of Tender Document

2.1.1. The Tender Document comprises the following together with any Addenda that may be issued from time to time.

- **Volume – I**

- Section – 0 : Background & Introduction
- Section – I : Invitation to Bid
- Section – II : Instructions to Bidders (ITB)
- Section – III : Scope of Work & Specifications
- Section – IV : Form of Contract
- Section – V : Conditions of Contract

- **Volume – II**



- Volume – 2 A : Supply Material Documents
- Volume – 2 B : Civil Works
- Volume – 2 C : Electrical & Instrumentation Works
- Volume – 2 D : Mechanical Works

2.1.2. The prospective Bidder shall carefully study and examine the Tender Document and Instructions and comply with all requirements of preparation of the Bid. Failure to furnish all information required by the Tender Document or submission of a Bid not substantially responsive to the Tender Document in every aspect will be at the Bidder's risk and may result in the rejection of the Bid.

2.1.3. Appropriate portions of the Technical Bid and Commercial Bids and Addenda or selected sections of the above Tender Document as appropriate will be incorporated in the contract that will be executed with the successful bidder.

2.1.4. The Bidder shall whether included in the Tender Document or not, provide the materials, equipment, services and works required to complete the Project.

2.1.5. Bidders may also make any additional enquiries or investigations necessary to become fully informed of all conditions which may affect the effective execution of the Project. Failure on the part of the Bidder to diligently investigate any condition which may affect PC Contractor's scope shall not relieve the Bidder of the

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responsibility of executing the Contract. Contract shall be abiding as per terms and reference agreed in tender documents and during clarifications.

2.1.6. The Tender Document is confidential and sole property of OGDCL and is being forwarded only to Bidder solely for the purpose of preparation and submission of bid. Information contained in these documents is confidential and should not be divulged to third party or an outsider without the prior written consent of OGDCL. Any mistreat of documents will be considered as cheated and will be taken strong response against that. The information could be shared, only as needed, with those who are directly or indirectly involved in preparation of Bid. Any person allowed access to these documents or to information contained therein must be instructed to hold it in strict confidence. Bidders who are not successful may be requested to return these Documents after being advised that their Bid has not been accepted. Bid proposal received by OGDCL will be treated in strict confidence.



2.2. **Clarifications of Tender Document**

Clarification, or any other information, if required can be obtained from Engineering Consultant's Project Manager with copy to Manager (Projects) OGDCL and Project Coordinator OGDCL whose address is also given below:

- a) Project Manager
(Maru-Reti Compression Project)
9th Floor, Tower "A", OGDCL House, Blue Area
Islamabad, Pakistan
Telephone: (92-51) 2623142
E-mail: iftekhhar_ahmed@ogdcl.com

- b) Project Coordinator
(Maru-Reti Compression Project)
9th Floor, Tower "C", OGDCL House, Blue Area
Islamabad, Pakistan
Telephone: (92-51) 920024140
E-mail: ali_raza@ogdcl.com

- c) Manager (Supply Chain Management) (Foreign)
Oil and Gas Development Company Limited
OGDCL House, Jinnah Avenue Blue Area
Islamabad, Pakistan
Telephone: (92-51) 920023780
E-mail: ejaz_rizvi@ogdcl.com

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- d) Project Manager
(Maru-Reti Compression Project)
Petrochemical Engineering Consultants
C-2, Block No. 17, Gulshan-E-Iqbal,
Karachi-75300, Pakistan.
Telephone: +92 (21) 34827780
Fax No.: +92 (21) 34961089
Email: Adeel@pcec.com.pk



OGDCL/Engineering Consultant will respond in writing to any request for clarifications of the Tender Document, which it receives not later than ten (10) days prior to the deadline for the submission of bids prescribed in the Tender notice. Written copies of Engineering Consultant's response (including an explanation of the query but without identifying the sources of inquiry) will be sent to all participating Bidders.

2.3. **Compliance of Tender Document**

The bidder shall strictly comply with the basis of Tender Document, Scope of work, Specifications. No major deviations/exceptions to the stipulation of the Tender Document shall be acceptable which may lead to rejection of bid.

2.4. **Amendments to Tender Document**

- 2.4.1. At any time prior to the deadline for submission of Bids, OGDCL may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Tender Document by amendment.
- 2.4.2. The amendment shall form part of the Tender Document, and shall be notified in writing by fax or e-mail to all prospective Bidders who have received/downloaded the Tender Document, and will be binding on them. The Bidders are required to acknowledge receipt of any such amendment in the Tender Document.
- 2.4.3. In order to provide prospective Bidders reasonable time in which to take the amendment into account in preparing their Bids, OGDCL may, at its discretion, extend the deadline for the submission of Bids.

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3.0 PREPARATION OF BIDS

3.1. Language of Bid

Bid shall be typed written or printed. The Bid prepared by the Bidder and all correspondence and documents (i.e. reports, specifications, standards, drawings) relating to the Bid exchanged by the Bidder and OGDCL/Engineering Consultant shall be written in the English language. Any printed literature furnished by the Bidder may be written in another language, provided that this literature is accompanied by an English translation duly signed and stamped by the Notary public of the Country of Origin, in which case, for purpose of interpretation of the Bid, English translation shall govern.

3.2. Documents Comprising the Bid

The Bid to be submitted by the Bidder shall comprise of two separate proposals i.e. “Technical Proposal” and “Commercial Proposal”. One (01) copy each of Technical Proposal and Commercial Proposal shall be prepared along with two CDs or USB of the Soft Copy. One set marked “ORIGINAL” and the other sets marked “COPY”. In case of any discrepancy in the copy, the ORIGINAL shall govern.

3.2.1. Technical Proposal



The technical proposal shall consist of the following:

3.2.1.1. General

The following information shall be submitted, separately, with the Technical Bid:



- i. Corporate & Financial information of Bidder and its consortium/joint venture partners as per format given in **Annexure – I**.
- ii. A list and details as per **Annexure – II** of Gas Processing and related projects being executed by Applicant’s organization along with project schedule.
- iii. Provide a comprehensive list and details as per **Annexure – III** of projects executed.

Certificates of satisfactory completion by the respective client/ owner should be attached with duly filled **Annexure-III**. Only those projects whose certificates are attached would be considered in experience &



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track record of the bidder/company.

- iv. Details of available Project Management Procurement QA/QC system as per **Annexure-IV**.
- v. Copy of Memorandum of Understanding (MOU) entered into by the consortium/joint venture partners as per article 1.5. (Applicable for Joint Venture/Consortium Bids).
- vi. List of major construction & related machinery & equipment (which are in working condition) owned by your organization/joint venture/consortium.
- vii. Details of technical support services as per **Annexure – V**.
- viii. List of computer software & hardware available with your organization. Also specify software which your organization plans to use in procurement, material management, construction management, tracking & inventory management and project planning control.
- ix. Details of Health, Safety and Environment (HSE) Policy and System as per **Annexure – VI**.
- x. Original Bid Bond for an amount of PKR 03 Million or equivalent in US\$ on the format as given in **Annexure – VII**. The bank guarantee to be issued only from banks listed in **Annexure- VII**, non-compliance to which will lead to rejection of bid.
- xi. Undertaking on the bidder's company's letter head duly signed and stamped for no price escalation for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project (and hand-over to OGDCL) under the subject Contract for entire duration of the Contract and its mutually agreed extension by both OGDCL & the Contractor.



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- xii. Undertaking on the bidder's company's letter head duly signed and stamped stating that Bidder shall assume full responsibility for Start-up, Commissioning assistance and performance testing of the New Compressor package under the supervision and as per guidelines of OEM, along with all commissioning, hook-up of complete civil, Electrical, Mechanical and integration Works required for the integration of the package with the Existing facility for completion of Maru-Reti Compression Project under the directives and supervision of OGDCL/Engineering Consultant and as per the specifications/drawings attached with the Tender document.
- xiii. Bidder's duly signed appropriate Confidentiality Agreement with OGDCL for non-disclosure of information with regard to Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project except for the sole purpose of this bidding process or performing of Works under the Contract if Bidder is selected as Contractor.
- xiv. Undertaking on the bidder's company's letter head duly signed and stamped, stating that the Bidder shall abide by all, Federal, Provincial or local laws, regulations of Pakistan and procedures which are and shall be applicable to the execution of the project.
- xv. The Bidder shall provide an undertaking on the bidder's company's letter head duly signed and stamped warranting and providing guarantee of the defect free and on specification operation of the of New Reciprocating Compressor and integration Works required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project as per requirements mentioned in Tender Documents for the supplied material, services, workmanship etc. under this contract.
- xvi. Undertaking on the bidder's company's letter head duly signed and stamped, stating Bidder's confirmation of and adherence to the format of Performance Guarantee attached as Annexure to the Draft Contract

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Agreement (part of the Tender Documents). The bank guarantee for performance bond to be issued only from banks listed in **Annexure-XVI**.

- xxvii. Undertaking on the bidder's company's letter head duly signed and stamped, confirming that Bidder's offer includes appropriate utilization of local Materials, Equipment and Services available in Pakistan. The foreign source Equipment, Materials and Services shall preferably be supplied from a country maintaining bilateral trade relation with the Islamic Republic of Pakistan.
- xxviii. Undertaking on the bidder's company's letter head duly signed and stamped, stating compliance to approved Manufacturer's list for Equipment and Materials provided in the tender document.
- xix. Confirmation of Period of bid validity as 180 days
- xx. Form of Tender or Bidding Form as per **Annexure – VIII**.
- xxi. Un-priced data summary sheet **Annexure – XIV**.
- xxii. Letter of Authorization in favor of Officer signing the Bid.
- xxiii. A power of Attorney certified by Notary Public (Applicable for Joint Venture/ consortium Bids).
- xxiv. Duly initialed and stamped copy of complete original set of Tender Document along with Integrity pact as per **Annexure-IX-A** and Integrity & Ethic Undertaking as per **Annexure-IX-B** by the Bidder's authorized official to signify that the Bidder has reviewed all the documents and his Bid is in compliance with the requirements stated therein. In addition to original set, one copy shall also be submitted.
- xxv. A confirmation or undertaking on the bidder's company letter head duly signed and stamped stating that the Bidder's ultimate parent Company (if the Bidder's company is owned by a holding company or corporation) shall submit the Parent Company, if required.
- xxvi. A statement on the bidder's company's letter head duly signed and stamped that the goods / materials, if supplied by the Contractor under the Contract if required, shall be "Unused and Brand New" and shall

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carry a warranty for satisfactory performance and the Bidder if selected as Contractor shall be liable for removing any defect or replacement of any defective equipment, material (supplied by the Contractor under the Contract) or workmanship during the Warranty Period in accordance with the terms of the Contract.

- xxvii. Not Applicable
- xxviii. Copy of valid Bidder's Company NTN (National Tax Number) certificate, Income Tax exemption certificate (if applicable) and Provincial Sales Tax (for Services) registration certificate or an undertaking on the bidder's company's letter head duly signed and stamped that the Bidder shall obtain the above mentioned registration certificates before the award of the Contract, if selected as Contractor.
- xxix. Copy of Pakistan Engineering Council valid Registration certificate in the applicable category and discipline or an undertaking on the bidder's company's letter head duly signed and stamped that the Bidder shall obtain the registration certificates as per OGDCL's requirements before the award of the Contract if selected as Contractor and that Bidder and its engineering staff should meet all the requirements of Pakistan Engineering Council (PEC) Act 1976, its bylaws and amendments to-date and provide documents to OGDCL to this effect.
- xxx. A statement of total compliance with the requirement of Tender Document.
- xxxi. Minor deviations/exceptions (if any) including technical and contractual matters as per format given in **Annexure-X**. The deviations/exceptions on the basis of tender document or major deviation from the conditions of the contract or project specifications shall not be accepted irrespective of their rankings in Technical and Commercial Evaluation which will lead to rejection of the bid. Any deviation/exception/exclusion found elsewhere (stated other than deviation list) shall not be considered and subject to automatic deletion/adherence with Tender Document if found, non-compliance in this regard may lead to rejection of bid.
- xxxii. A statement on the validation of the Tender Document. The statement shall confirm that Technical Specifications and other data/information provided to the bidder have been thoroughly checked and the bidder is

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satisfied with its suitability and sufficiency in order to perform his obligations under the proposed Contract. Any discrepancy and/or anomaly in the Technical Specifications and data/information have been identified and the cost of removing such discrepancies and anomalies is now at the risk of the PC Contractor.

- xxxiii. Details of available equipment and machinery as per **Annexure-XI**. (please see point vi)
- xxxiv. Unpriced, initialed and stamped BOQ/Price schedule (as per format given in **Schedule – A**).
- xxxv. Affidavit as per **Annexure-XV**.
- xxxvi. The PC Contractor shall furnish a statement on its letterhead confirming complete compliance to the Vendor List as attached in **Schedule-A** of the document herein, for procurement of equipment/material under his scope as detailed in **Section-III** and its annexures thereof.



3.2.1.2. Technical Details

The technical proposal shall contain following information/details and documents as a minimum:

- a) Bidder's overall project execution plan and human resource deployment plan for all stages of the work (i.e. Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project and hand-over to OGDCL). The curriculum vitae of key personnel are required to be provided. The Curriculum Vitae (CV) shall include the proposed position, qualification, experience and age of the person. The format to be filled is presented in **Annexure-XII**. The key personnel, if accepted by OGDCL, shall be nominated in the final Contract
- b) Proposed master and level-3 project schedule with CPM network, showing the interface activities for the work.
- c) Bidder's plan for co-ordination with OGDCL/Engineering Consultant, other suppliers and relevant government agencies and departments.

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- d) Bidder's plan for completion of works on receipt of different equipment/materials
- e) Detailed construction plan covering construction strategy, availability and use of construction, installation/erection, equipment, interfacing and approach/construction methodology.
- f) Details of approach to be adopted and resources to be employed for carrying out tie-ins/hook-up with the existing facility (i.e. piping, electrical and instruments) in a limited duration of time i.e. shutdown and pre-commissioning and commissioning.
- g) Detailed procedure of how physical progress and percent completion will be measured, tracked and reported for each component of the work (i.e. Procurement (Supply), construction, Fabrication installation/erection, pre-commissioning, Commissioning & Start up).
- h) Detailed description of Quality Assurance and Quality Control procedures and safety, QA/QC organization which the Bidder intends to adopt/follow for this project (These procedures should be Project specific).
- i) Health, Safety and Environment (HSE) project specific plan/procedures, safety/accident record, construction safety policy and site safety procedures. The plan and procedures should be in line with OGDCL's HSE policy and procedures.
- j) Areas of the work proposed to be Sub-contracted with names, address, capabilities, past experience and other corporate and technical details of Sub-Contractors. The major works shall not be Sub-contracted.
- k) A written consent from the Sub-contractor(s) for entering into an agreement with the bidder for the specified work of the Project.
- l) If the Bid is being submitted in collaboration with other companies, then:
 - Name and address of companies with whom collaboration is being done.
 - Areas of collaboration should be specified.
 - Capabilities and past experience and other corporate and technical details of Sub-Contractors.
- m) Duly initialed and stamped copy of blank BOQ/price schedule i.e. without prices (Please do not fill in prices).
- n) Any other technical or other information/details, which in Bidder's opinion is necessary for a better assessment of his Bid proposal.

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3.2.2. Commercial Proposal

3.2.2.1. Contents of Commercial Proposal



- a) Duly filled, initialed and stamped BOQ/Price schedule (as per format given in **Schedule – A**).
- b) Schedule of rates for additional work as per **Annexure – XIII**.
- c) Not Applicable
- d) Data Summary Sheet as per **Annexure – XIV**.

3.3. **Bid Price and Payment Terms**

3.3.1. Bid Price

The Bidder shall not fill in prices/rates for equipment/material, works and commissioning separately. However, all the procurement and works amounts will be added to reach the final cost of contract as described in BOQs/Price schedule given as **Schedule -A**.

The Contract shall be responsible for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project as per requirements stipulated in the tender document and meeting the technical specifications, applicable standards and OGDCL's objectives and requirements. The Contract shall be on item-wise price/unit rate basis. The total Contract price shall be an estimated amount in Pak Rupees subject to variation on account of changes in quantities of items given in BOQs and for additional work. The item-wise price/unit rate shall include shipment cost, insurance, duties, sales and other taxes, levies etc. as well all procedures, instructions, HSE requirements, Quality and testing requirements, etc. as stipulated in relevant Scope of Work, BOQs' instructions, Project specifications or anywhere mentioned in the tender documents, and shall remain fixed during the performance of the Contract. The item-wise price/unit rate shall not be subject to escalation throughout the duration of the contract period regardless of any circumstance whatsoever even unforeseen at present.

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The PC Contractor shall be paid on item-wise price/unit rate basis as per BOQs/Price Schedule and actual quantities verified by OGDCL/Engineering Consultant. Any wastage shall be on PC Contractor's account and no compensation shall be payable to the PC Contractor against any wastage.

The prices of equipment and material imported in finished form shall be inclusive of all taxes including insurance, custom duties, sales tax as applicable in Pakistan and freight charges up to site which shall be paid in Pak Rupees. The custom duty shall be levied at a concessional rate as applicable on imports of equipment & material by E&P companies under SRO 678 (I)/2004. OGDCL shall only provide facilitation letters to the Contractor in obtaining required duty concessions as per SRO. 678 (I)/2004. However, obtaining such concessions and custom clearance shall be sole responsibility of the Contractor.



Any tax deduction shall be made as per prevailing laws/regulations

3.4. **Bid Validity**



- 3.4.1. The bid shall remain valid for one hundred and Eighty (180) calendar days after the date of Technical bid opening.
- 3.4.2. In exceptional circumstances, OGDCL may solicit the bidder's consent to an extension of the period of validity. The request and the response there to shall be made in writing (by telefax or email). The bid bond provided under Instruction 3.5 shall also be suitably extended. A bidder may refuse the request without forfeiting its bid security. A bidder granting the request will not be required nor permitted to modify its bid.

3.5. **Bid Bond**

- 3.5.1. The Bidder shall furnish, as part of its Bid, a Bid Bond (**Annexure – VII**) of an amount of PKR 03 Million or equivalent in US\$. The bank guarantee to be issued only from banks listed in **Annexure-VII**, non-compliance to which will lead to rejection of bid.
- 3.5.2. The Bid Bond is required to protect OGDCL against the risk of Bidders' conduct which would warrant the Bid Bond encashment pursuant to Instructions given in following paragraphs.
- 3.5.3. The Bid Bond shall be denominated in Pak Rupees or equivalent in US\$, and shall be in the following form:



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- A bank guarantee or pay order amounting of PKR 03 Million or equivalent in US\$ from any bank listed in **Annexure-VII** valid for 210 days counting from day of bid opening. Non-compliance to which will lead to rejection of bid.
- 3.5.4. Any Bid not accompanied with the Bid Bond of required amount shall be rejected by OGDCL as non-responsive.
- 3.5.5. Unsuccessful Bidders' Bid Bond will be discharged/returned as promptly as possible as but not later than 30 days after the expiry of the validity period of Bid Bond
- 3.5.6. The successful Bidder's Bid Bond will be discharged upon the Bidder's executing the Contract, and furnishing the Performance Bond, pursuant to Instruction 6.5.
- 3.5.7. The bid bond may be forfeited if a bidder withdraws his bid during the period of bid validity or if the Bidder, having been notified of the acceptance of his bid by the Company during the period of bid validity:
- Fails, refuses or delays to execute the Contract in accordance with the instruction to Bidders, or
 - Fails, refuses or delays to furnish Performance Bond in accordance with the instruction to Bidders.
- 3.5.8. The Bidders must particularly note that in case of submission of forged Bid Bond they will be liable to severe punitive action by OGDCL leading to Black Listing in addition to any other legal action, which shall be initiated against such Bidder.
- 3.5.9. Bid Bond in the shape of bank guarantee shall not be acceptable from those banks:
- Whose market price per share is quoted below the par value at the Pakistan Stock Exchange on bid opening date.
 - NOT listed at Pakistan Stock Exchange.
- 3.5.10. However, bid bond in shape of Pay orders (PO) / Cash Deposit Receipts (CDR) / Demand Drafts (DD) issued by a Pakistani scheduled Bank (listed or not listed at Pakistan Stock Exchange) or a branch of foreign bank operating in Pakistan shall be accepted.

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3.6. **Format and Signing of Bid**

- 3.6.1. The Bid Comprising Technical and Commercial Proposals with accompanying documents and clearly marked 'Original Bid', plus two (2) copies must be received by OGDCL at the date, time and place as specified. In the event of any discrepancy between the original and the copy, the original shall govern.
- 3.6.2. The original and copies of the Bid shall be typed or written in indelible ink and shall be signed and stamped by a person or persons duly authorized to sign on behalf of the Bidder. All pages of the Bid shall be initialed by the authorized person or persons. Proof of authorization shall be furnished in the form of authorization letter on original letterhead of the Bidder signed by President, Chief Executive/Chief Operating Officer, Managing Director of Company/Corporation.
- 3.6.3. The Bid shall contain no interlineations, erasures or over-writing except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

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4.0 SUBMISSION OF BID

4.1. Sealing and Marking of Bids

4.1.1. For the submission of Bid as stated earlier in this document a Single stage – two envelope bidding procedure shall be adopted. Technical and Commercial Bid proposals shall be submitted in separate envelope. Both the envelopes should then be put in one sealed envelope as described below.

4.1.2. The Original Technical and Commercial Bids shall be separately packed in an inner envelope marked as Technical (Original) or Commercial (Original) Bid as the case may be; each inner envelope shall be sealed in an outer envelope, which shall also be marked. Copies of the Technical and Commercial Bids shall be sealed and marked in separate inner and outer envelopes.

4.1.3. The outer sealed envelope shall be addressed to:

**Manager (SCM)
Supply Chain Management Department
Oil & Gas Development Company Limited
OGDCL House, 1st Floor, G-6/F-6,
Jinnah Avenue, Islamabad (Pakistan)
Ph No. +92-51-920023597**

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021



**HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL FOUNDATIONS &
STRUCTURE / PRE-COMMISSIONING / COMMISSIONING & START UP
ASSISTANCE OF MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-
RETI COMPRESSION PROJECT (PC)**

**DO NOT OPEN BEFORE _____ HRS _____ 2021 AS PER PRESS
ADVERTISEMENT**

TECHNICAL/FINANCIAL BID(s) (INDICATE ONE ON EACH ENVELOPE)

4.1.4. The sealed envelope shall indicate the name and address of the Bidder to enable the bid to be returned unopened in case it is declared LATE.

4.1.5. OGDCL will not be held responsible for the premature opening or misplacement of any Bid not clearly marked and addressed in accordance with Instruction 4.1.3.

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4.2. Deadline for Submission of Bids



- 4.2.1. Bids must be received by OGDCL at the address specified under Instruction 4.1.3 not later than the date and time given in the press advertisement.
- 4.2.2. OGDCL may, at its discretion, extend this date for the submission of Bids by amending the Tender Document in accordance with Instruction 2.3 in which case all rights and obligations of OGDCL/Engineering Consultant and Bidders will extend likewise.

4.3. Late Bids

- 4.3.1. Any Bid received by OGDCL after the date for submission of Bids prescribed by OGDCL, pursuant to Instruction 4.2.1 shall be rejected and returned unopened to the Bidder.

4.4. Modification and Withdrawal of Bids

- 4.4.1. The Bidder may modify or withdraw its Bid after the bid's submission, provided that written notice of the modification or withdrawal is received by OGDCL prior to deadline prescribed for submission of the Bids.
- 4.4.2. The Bidder's modifications or withdrawal notice shall be prepared, sealed, marked and dispatched in accordance with the provisions of Instruction 4.1. A withdrawal notice may also be sent by email/fax or cable but followed by a signed confirmation copy, postmarked no later than the deadline for submission of the Bids.
- 4.4.3. No Bid shall be modified subsequent to the deadline for submission of the Bids.
- 4.4.4. No Bid shall be withdrawn in the interval between the date for submission of Bids and the expiry of the period of Bid validity specified by the Bidder on the Bid Form. Withdrawal of a Bid during this interval may result in encashment of Bid Bond under Instruction 3.5.7.

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5.0 BID OPENING, CLARIFICATIONS AND EVALUATION

5.1 Bid Opening

OGDCL will first open Technical Bids, in presence of Bidder's representatives who choose to attend, at _____ hrs _____ 2021 as given in the press advertisement at the following location:



Manager (SCM)
Supply Chain Management Department
Oil & Gas Development Company Limited
OGDCL House, 1st Floor, G-6/F-6,
Jinnah Avenue, Islamabad (Pakistan)
Ph. No. +92-51-920023597

The Bidder's representatives who are present shall sign a register evidencing their attendance.

The Commercial Bid of technically responsive bids will be opened on above location in presence of Bidder's representative who chooses to attend. The date and timings of commercial bid opening will be intimated to relevant Bidders.

5.2 Clarifications of Bids

- 5.2.1. OGDCL/Engineering Consultant may ask Bidders individually for clarifications of their Bid during the process of examination, evaluation and comparison of Bids under intimation to Procurement Department. The request for clarifications and the response shall be in writing.
- 5.2.2. If as a result of any clarification sought by OGDCL/Engineering Consultant some changes are made in Scope of Work or technical specifications the bidder shall confirm its compliance to the clarifications/changes. If the bidder fails to comply with the changes then his bid shall be considered non responsive;
- 5.2.3. If bidder(s) not willing to confirm their technical bid/proposal to the revised/tender technical requirement shall be allowed to withdraw their respective bid(s) without forfeiture of their bid bond;
- 5.2.4. The additions/deletions will be opened along with the initial commercial proposal which shall be made the total bid price for commercial evaluation purpose.

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5.3. Evaluation of Bids

The evaluation of Bids shall be strictly on the basis of information provided in Technical and Commercial Bids. Technical bids shall be evaluated first. After completion of technical evaluation, commercial bids of technically qualified Bidders shall be opened and evaluated. The Evaluation process will consist of following stages:

- Summary rejection of Bid
- Preliminary Technical Examination
- Detailed Technical Evaluation
- Commercial Evaluation

The following paragraphs present coverage of each evaluation stage;

5.3.1. Criteria for Summary Rejection of Bid



The Bids not meeting the following mandatory criteria shall be summarily rejected without right of appeal:

- Bid must be prepared in English language.
- Bid must be prepared as instructed vide clause 3.0 hereof.
- Bid must be valid for “180” days from the Date of Technical Bid Opening.
- Technical Bid must be accompanied with original Bid Bond as specified in Clause 3.5 hereof. The bank guarantee to be issued only from banks listed in **Annexure-VII**.
- Bid must reach at the specified OGDCL address before “_____” Hours PST on “_____”, 2021 as given in the press advertisement
- Bid must not be submitted in form of telex or telegram or fax.
- Bid must indicate name, title, phone, fax and e-mail address of the key person for correspondence.
- Bid must be quoted for complete project as per scope of work given in the tender document.
- Bid must be on Bidder’s original letter head/pad.
- Bid must include all annexures i.e. Checklists, bidding form, blacklisting affidavit, data summary sheet, corporate information etc.
- Technical bid must be accompanied by Affidavit (**Annexure-XV**) for Not Black Listing on Non-Judicial Stamp Paper of Rs. 100/-.

5.3.2. Preliminary Technical Examination

The preliminary technical examination will focus on the following:

- Fulfilment of eligibility requirement as mentioned in Section 1.5 of ITB

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- Past experience in similar nature of projects as required in section 3.2.1.1 (General) bullet ii & iii.
- Technical qualification & capability.
- The quoted priced is firmed/fixed and not based on any price adjustable formula/any escalation
- Bid must be quoted for complete scope or work, incomplete and conditional bid shall be rejected.

Only those bids which will clear the preliminary technical examination will undergo detailed technical evaluation.

5.3.3. Bid Evaluation

The Technical & Commercial evaluation shall be based on the following:

- **Detailed Technical Evaluation**



The bids will be first technically reviewed and screened with respect to compliance to the basis of tender document scope of work, specifications & BOQ. No major deviations/exceptions to the main stipulations of tender document shall be accepted. All those bids which have not complied to the earlier mentioned aspects shall be rejected. After completion of technical screening the technical bids will be thoroughly examined and evaluated with the objective of assessing their compliance and completeness in detail, conformity to the specifications, warranty/guarantee and responsiveness to the requirements stipulated in the tender documents.

During examination the Bidders may be requested individually to respond to technical queries, and to confirm technical aspects. The objective of this exercise shall also be to bring all the Bids to the same and acceptable level of conformity with the Scope of Work.

The technical evaluation shall be based on areas as detailed below:

S No.	Area	Accepted/Rejected
1.	Compliance to the complete scope of work	
2.	Compliance to the technical bid requirements & details as per article 3.2.1 & Clause 1.5 to tender	
3.	Procurement strategy capability & adherence to specifications	
4.	Construction, Commissioning assistance capabilities & plan	
5.	Available physical & Human Resources	

NOTE: Bidder shall meet all the above technical qualification requirements.

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- **Commercial Evaluation:**

The commercial bids of only technically qualified Bidders will be opened for evaluation. The commercial evaluation and price comparison will be based on the total of the price of in the **Schedule-A** of this document.

In case the technically responsive and financially lowest bidder has also quoted the optional items the optional items will only be included subject to their price rationality and comparability.

The commercial evaluation will cover:

- **Error Correction:**



Arithmetic errors in computation and summation shall be checked. The errors shall be corrected in the following manner:

- a. Where there is a discrepancy between amounts in figures and in words, the amount in words shall govern and
- b. Where there is a discrepancy between the unit rate and the total amount derived from the multiplication of the unit rate and the quantity, the unit rate as quoted shall govern.

With the addition of above effects to each Bidder's total quoted price the evaluated price shall be arrived. The financially lowest evaluated price will be considered for award of contract.

5.4. **Contacting OGDCL or Engineering Consultant**

- 5.4.1. Subject to Instruction 5.3 no Bidder or his agent shall contact OGDCL or Engineering Consultant on any matter relating to its Bid, from the time of the Bid opening to the time the Contract is awarded.
- 5.4.2. Any effort by Bidder to influence OGDCL or Engineering Consultant in its Bid evaluation, bid comparison or Contract award decisions may result in the rejection of the Bidder's Bid.

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6.0 AWARD OF CONTRACT

6.1. OGDCL's Right to Accept any Bid and to Reject any or all Bids

6.1.1. OGDCL reserves the right to accept or reject any bid or part of a bid and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders.

6.2. OGDCL's Right to Vary the Scope of Contract

6.2.1. OGDCL reserves the right at the time of award of Contract to make addition and deletions in any component of scope of work or vary the scope of work given in the Tender Document.

6.3. Notification of Intent to Award

6.3.1. Prior to the expiration of the period of bid validity, OGDCL will notify the successful Bidder in writing by email/fax or courier service its intent to award the contract. The Contract will be executed subject to unconditional acceptance of Letter of Intent (LOI) from the Bidder.

6.3.2. Upon the successful bidder's furnishing of Performance Bond pursuant to Instruction 6.5, OGDCL will promptly notify each unsuccessful bidder and will discharge its Bid Bond pursuant to Instruction 3.5.7.



6.4. Signing of Contract

6.4.1. At the same time as OGDCL notifies the successful Bidder of its intent to award the Contract, OGDCL will send the Bidder the Form and Conditions of Contract Volume-I (**Section-IV & Section-V**) provided in the Tender Document, incorporating all agreements between the parties.

6.4.2. Within ten (10) days of receipt of the Form and Conditions of Contract the successful bidder will be required to sign the Contract and return it to OGDCL.

6.5. Performance Bond



6.5.1. Within fifteen (15) days of the receipt of notification of intent to award the Contract from OGDCL, the successful Bidder shall furnish a Performance Bond in the Form of Bank Guarantee (**Annexure-XVI**) for an amount of ten percent (10%) of the Contract value as a guarantee for the due and faithful performance of the Contract. The said Performance Bond shall be Valid for one year from date of acceptance certificate The validity of Performance Bond/Bank Guarantee shall be extended by the Contractor if the completion of contract is delayed, whether in whole or in part. The cost incurred

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for establishing the Bank Guarantee / Performance Bond or any extension thereof shall be to the account of the Contractor. The performance Bond shall be issued only from banks listed in **Annexure- XVI**.

- 6.5.2. Failure of the successful Bidder to comply with the requirements of Instruction 6.4 or 6.5 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Bond, in which event OGDCL may make the award to the next lowest evaluated Bidder or call for new Bids.

ANNEXURE - I

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ANNEXURE - I

FORMAT OF CORPORATE & FINANCIAL INFORMATION

PART – I

GENERAL INFORMATION

1. Name (Full Company Name):

- Postal Address:
- Telephone:
- Facsimile:
- e-mail:
- Website Address:

Has the Company operated under any other name? If yes please give name, date of change and reason for change.

2. Type of Entity/Firm:

- Corporation/Stock Company:
- Public Limited:
- Private Limited:
- Partnership:
- Proprietorship:

3. Shareholders information/pattern with names and addresses of majority shareholders.



4. Place of Incorporation/Registration:

5. Year of Incorporation/Registration:

(Please provide copies of Incorporation/Registration Certificates and Memorandum & Articles of Association)

6. Company's National Tax No.

7. Company's Core Business Areas and their annual sales revenue/earnings during last five (5) years.

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8. Name & Address of Owners/Directors
9. Registration with Pakistan Engineering Council (PEC) as Contractor. Please provide copy of membership valid certificate issued by PEC, if applicable.
10. Name and details of Joint Venture/Consortium Partners (if any).
11. Name and Contact Details (Email/Phone #) of signing authority.



PART – II

FINANCIAL STRENGTH

1. Provide details with regard to the financial standing of the applicant including copies of last three (3) years Audited profit & loss account and balance sheet. Also, please fill the financial summary as per below table;

S. No.	Description	Years		
		2018	2019	2020
1	Sales Revenue			
2	Paid Up Capital			
3	Profit Before Tax			
4	Profit After Tax			
5	Current Assets			
6	T. Asset			
7	Owner Equity			
8	Long Term Debt			
9	Current Liability			
10	Total Liabilities			

2. Bank(s) credit worthiness certificates (Latest Period) of applicant organization and available credit ceiling/limits with Account Number/Title.
3. Detail record with regard to litigation/arbitration proceedings or any other dispute related to project undertaken/being undertaken by the Bidder their Sub-Contractors and Suppliers

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(Specially with OGDCL it Joint Venture Partners or other public and private organizations working in the Oil & Gas sector of Pakistan) during past five (05) years.



4. Any information including brochures, references and other documentary evidence of technical qualification, capability and experience of the Applicant to execute the Project.

The undersigned on behalf of _____ hereby declare that the statements made and the information provided official herewith is complete, true and correct in every detail.

Signature

Official Seal of the Company

ANNEXURE - II

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ANNEXURE-II



GAS PROCESSING AND RELATED SECTOR PROJECTS BEING EXECUTED

S. No.	Owners' "Name, Description & Capacity of the Project"	Name & Address of Client	Country and year	Project Completion period	Total contract value*			Detailed description of work and responsibilities**	Details of Equipment procured (including nature/type of equipment, its value* and origin/source)	Details of qualification of manpower employed	Name of Sub-contractors/Consultants and their work scope	Whether the project is on schedule? If not specify reasons for delay and give expediting plans
					Foreign Currency	Local Currency	Total					

(*) Please indicate name and unit of currencies

(**) For example design, engineering, procurement, construction and commissioning.

ANNEXURE - III

	MARU-RETI COMPRESSION PROJECT			
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ANNEXURE-III

**GAS PROCESSING PLANTS HAVING CAPACITY OF ATLEAST 10MMSCFD (each) OR ABOVE / COMPARIBLE
PETROCHEMICAL PLANTS ON PROCUREMENT, CONSTRUCTION & COMMISSIONING BASIS EXECUTED DURING LAST
SEVEN (07) YEARS**



S. No.	Owners' "Name, Description & Capacity of the Project***	Name & Address of Client	Country and year	Project Completion period		Total contract value*			Detailed description of work, Scope and responsibilities**	Details of Equipment procured (including nature/type of equipment, its value* and origin/ source)	Details of qualification of man power employed	Name of Sub-contractors / Consultants and their work scope	Whether the project is on schedule? If not specify reasons for delay and give expediting plans
				Planned	Actual	Foreign Currency	Local Currency	Total					

(*) Please indicate name and unit of currencies

(**) For example design, engineering, procurement, construction and commissioning.

(***) Certificates of satisfactory completion by the respective client/ owner should be attached with this duly filled Annexure. Only those projects whose certificates are attached would be considered in experience & track record of the bidder / company.

ANNEXURE - IV

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ANNEXURE-IV

PROJECT MANAGEMENT AND QA/QC SYSTEMS

1. Describe your document control system and /or procedures to control, development, approval and distribution of technical documents, particularly required from and Engineering Company

2. Do you track (progress, follow, schedule) all activities from the date of placement of order through completion of project.

_____ YES _____ NO

Please explain how you track all activities from placement of order through completion of project.

3. Does your company have capabilities for Electronic Data / Information Interchange?

_____ YES _____ NO



If yes, please provide details.

If no, does your company plan to develop these capabilities? _____ YES _____ NO

4. How does your company identify problems that might affect the completion of an order?

5. What system do you have for quoting lead times and to ensure adherence to the schedule time?

6. How do you get commitment from your Sub-contractors to ensure compliance with your quoted lead times and prices?

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7. Do you have established procedure to handle damaged material / equipment and / or unsatisfactory services?

_____ YES _____ NO

If yes, please provide details.

8. How does your company ensure that contract / purchase order data and drawings are accurate, legible and submitted on a timely basis?

9. Has your company formats to communicate the problem or the potential problem to the customer (if any)?

In that case please provide a sample of such format.

Do you have a QA / QC program manual?

_____ YES _____ NO



If yes, please provide copy of the same

10. Does documented procedure exist to support the QA / QC manual?

_____ YES _____ NO

If no, how is your QA / QC program implemented?

(Please provide some sample of such documentation to support your claim)

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11. Do you have standard format for a formal review / audit of the QA / QC program?

_____ YES _____ NO

If yes, provide details / sample.

12. Does the QA / QC manager have any other responsibilities?

_____ YES _____ NO

If yes, please specify.



13. Describe your training and certification program for inspectors

14. Is your company certified to ISO 9001 _____, or ISO 140001 _____?

_____ YES _____ NO

15. List certificate of authorization and / Code Stamps you hold and the issuing authority. Has any certificate of Authorization and /or Code stamp ever been refused or suspended? If so, state which ones, give reasons and date

ANNEXURE - V

	MARU-RETI COMPRESSION PROJECT			
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ANNEXURE - V

TECHNICAL SUPPORT SERVICES

Please indicate only the type(s) of work your company is involved and is capable of undertaking

1.0 TECHNICAL SUPPORT SERVICES

1.1	Mechanical Testing	YES	NO
1.2	Radiography	YES	NO
1.3	Ultrasonic Survey and analysis	YES	NO
1.4	Non-Destructive-Testing	YES	NO
1.5	Corrosion Inspection	YES	NO
1.6	Noise Survey and Analysis	YES	NO
1.7	Quality Inspection	YES	NO
1.8	Safety Inspection	YES	NO
1.9	HSE Inspection	YES	NO
1.10	Third Party Inspection	YES	NO
1.11	Skilled/Specialist Technical Support Services:		
	Mechanical Fitter	YES	NO
	Rotary Equipment Supervisor	YES	NO
	Mechanical	YES	NO
	Civil	YES	NO
	Quality	YES	NO
	Safety	YES	NO
	HSE	YES	NO
	Pipeline	YES	NO
	Qualified Rigger (60 Tons lifting)	YES	NO
	Pipe Fitter/Welder	YES	NO
	Others	YES	NO
1.12	Non Skilled Support Services	YES	NO

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1.13 Vendor Assistance YES NO
Specify Vendors

1.14 Others YES NO

2.0 METALLIC PIPE INSTALLATION, COMMUNICATION AND MAINTENANCE



YES NO

2.1 Fabrication / Construction YES NO
2.2 Welding YES NO
2.3 Hot Tapping YES NO
2.4 Heat Treatment YES NO
2.5 Coating YES NO
2.6 Wrapping YES NO
2.7 Hydraulic YES NO
2.8 Pipe Work Inspection YES NO
2.9 Others YES NO

3.0 MECHANICAL WORKSHOP FACILITIES

YES NO

3.1 Machining YES NO
3.2 Welding YES NO
3.3 Heat Treating YES NO
3.4 Steel Fabrication YES NO
3.5 Blasting YES NO
3.6 Metal Spraying YES NO

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3.7	Electrolyte Coating	YES	NO
3.8	Hydraulic Testing	YES	NO
3.9	Valves Refurbishment	YES	NO
3.10	Others	YES	NO

4.0 INSULATION YES NO

4.1	Machining	YES	NO
4.2	Hot Insulation	YES	NO
4.3	Associate Insulation	YES	NO
4.4	Others	YES	NO



5.0 E&I WORKSHOP FACILITIES

5.1 Instrument / Erection / Installation / Calibration / Testing Equipment for following:

• Pressure	YES	NO
• Flow	YES	NO
• Level	YES	NO
• Temperature	YES	NO
• Concentration	YES	NO

5.2 Equipment for the following:

• Control Panel Installation	YES	NO
• Devices for testing, checking and Calibration of control panel items	YES	NO
• Devices for cable laying, Meggering, etc.	YES	NO

	MARU-RETI COMPRESSION PROJECT			
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6.0 ELECTRICAL WORKSHOP FACILITY

Electrical installations, Meggering, Testing devices for:

• Motors	YES	NO
• Bus Bar	YES	NO
• Control Modules	YES	NO
• Generator Control Panel	YES	NO
• Alternator	YES	NO
• Gas Engines	YES	NO
• Power Cables	YES	NO

Note: In case any service/facility is not available in-house but the company has standing arrangement to outsource such service / facility please indicate with sufficient details.

ANNEXURE - VI

	MARU-RETI COMPRESSION PROJECT			
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ANNEXURE – VI

HSE DETAILS

1- Do you have a formal written Safety Policy? YES NO

If yes, please attach a copy(s)

Is safety policy distributed to all employees and posted at the offices?

YES NO

2- Do you have a safety program manual? YES NO

1.1.1 If yes, please state scope

3- Do documented procedures exist to support the safety manual?

YES NO

1.1.2 If no, how is your safety program implemented?

4- Do you operate a formal review/audit of the safety program?

YES NO



1.1.3 How are review/audit results identified, documented and implemented?

5- Do you hold regular safety meetings for all employees?

YES NO

1.1.4 If yes, how frequently do you hold these meetings?

Weekly _____

	MARU-RETI COMPRESSION PROJECT			
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1.1.5 Fortnightly _____

1.1.6 Monthly _____

Others _____ When? _____

6- Do you hold regular safety inspection? YES NO

If yes, please provide details.



7- What Type of employee training programs are in place?

1.1.7 Is training delivered to Subcontractors / vendors? YES NO

Is training delivered to clients? YES NO

8- How are accidents investigated and reports circulated to management? Give a copy of any report if available.

ANNEXURE - VII

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-VII	

ANNEXURE - VII

BID BOND

Oil & Gas Development Company Limited,
OGDCL House, Jinnah Avenue,
Blue Area, Islamabad.



Guarantee No.....
Date of issue.....
Date of expiry.....
Amount.....

Dear Sir,

In consideration of M/S _____ herein after called "THE BIDDER" having submitted the accompanying Bid and in consideration of value received form (the Bidder above), we hereby agree to undertake as follows:

1. To make unconditional, immediate and forthwith payment of the sum of PKR. _____ -/ (Pak. Rupees. _____ Only) or Equivalent in US\$ _____ /- (United States Dollars _____ Only) upon your FIRST and SIMPLE written demand without further recourse, question, query, deferment, contestation or reference to the bidder, account party or any other person in the event of the withdrawal of the aforesaid bid by the BIDDER before the end of the period specified in the Bid after the opening of the same for the validity thereof or if no such period be specified, within 210 days after the said opening or if the Bidder, having been notified of the acceptance of his bid by the Company during the period of bid validity:
 - a. Fails, refuses or delays to execute the Contract in accordance with the instructions to the Bidders, or
 - b. Fails, refuses or delays to furnish Performance Bond in accordance with the instructions to Bidders.
2. To accept written intimation(s) from you as conclusive, sufficient and final evidence of the existence of a default of non-compliance, breach or default as aforesaid on the part of the BIDDER and to make payment immediately and forthwith upon receipt of your FIRST and SIMPLE written intimation.
3. No grant of time or other indulgence to, or composition or arrangement with the BIDDER in respect of the aforesaid Bid with or without notice to us shall affect this Guarantee and our liabilities and commitments hereunder.
4. This is an independent and direct obligations guarantee and shall be binding on us and our successor in-interest and shall be irrevocable.
5. The Guarantor Bank warrants and represents that it is fully authorized, empowered and competent to issue this guarantee.



Yours faithfully,
(BANKERS)

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-VII	

OIL & GAS DEVELOPMENT COMPANY LIMITED
List of Banks allowed for Bank Guarantees

Sr. No.	Bank Name
1	ALLIED BANK
2	ASKARI BANK
3	BANK AL HABIB
4	BANK ALFALAH LTD
5	FAYSAL BANK
6	HABIB BANK LTD
7	HABIB METROPOLITAN BANK
8	MEEZAN BANK LIMITED
9	MCB BANK
10	NATIONAL BANK OF PAKISTAN
11	STANDARD CHARTERED BANK
12	UNITED BANK LTD

ANNEXURE - VIII

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-VIII	

ANNEXURE - VIII

FORM OF TENDER OR BIDDING FORM

Dated: _____



TENDER ENQUIRY NO: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

To:

Oil & Gas Development Company Limited
OGDCL House, Jinnah Avenue,
Blue Area, Islamabad - Pakistan

Dear Sirs,

1. Having examined the Scope of Work and Instructions to bidders of Invitation to Bids, the receipt of which is hereby acknowledge, we, the undersigned, offer to Procure (Supply) Bulk piping, Electrical & instrumentation material, Construct, Fabricate, Install/Erect, hook-up, Pre-Commission and Commission the complete Civil, Electrical, Mechanical and integration Works as well as construct, install/erect, assemble, Pre-commission; provide commission & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project in conformity with the Scope of Work and Instructions to bidders at the rates mentioned in our Bid Proposal or other such sums as may be ascertained in accordance with the said conditions.
2. We confirm that the Terms and Conditions given in Tender Enquiry are acceptable to us and if our Bid is accepted we shall execute a contract with OGDCL accordingly without any exceptions, we further confirm to commence service withindays of the mobilization notice issued by OGDCL.
3. We agree to validate bid unconditionally for the period of 180 days from the date of opening the same and it shall remain binding upon us and may be accepted thereof, shall constitute a binding contract between us.
4. We further certify that all the contracts/orders placed on us by OGDCL/JV Partners have been executed timely and as per terms & conditions of the Contract/order without any unsettled dispute.
5. Until a formal Agreement is prepared and executed, this bid together with your acceptance thereof, shall constitute a binding contract between us.

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
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6. We understand that you are not bound to accept the lowest or any tender you may receive
7. Our bid proposal does not contain any deviation or exceptions from the terms & conditions enunciated in the tender documents. OR our bid proposal contains deviation or exception from the terms & condition enunciated in the tender documents as detailed in deviation form **(Annexure-X)**

Dated this _____ days of _____, 2021

Name & Signature _____ in the capacity of _____
duly authorized to sign tender for and on behalf of:

(NAME OF THE FIRM IN BLOCK CAPITALS)

Complete Address: _____
 Telephone No. _____
 Fax No. _____
 Phone No. _____

Signature: _____

Witness:

1.

(Name)



(Signature)

2.

(Name)

(Signature)

ANNEXURE – IX-A

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-IXA	

ANNEXURE-IX-A

INTEGRITY PACT
DECLARATION

..... *[the PC Contractor]* hereby declares its intention not to obtain or induce the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan (GoP) or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GoP) through any corrupt business practices.

Without limiting the generality of the foregoing,*[the PC Contractor]* represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from' GoP, except that which has been expressly declared pursuant hereto.

..... *[the PC Contractor]* certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

..... *[the PC Contractor]* accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to GoP under any law, contract or other instrument, be voidable at the option of GoP.



Notwithstanding any rights and remedies exercised by GoP in this regard, *[the PC Contractor]* agrees to indemnify GoP for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to GoP in an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by *[the PC Contractor]* as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP.

For

PC Contractor _____

Tender No. _____

ANNEXURE – IX-B

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-IXB	

ANNEXURE-IX-B

(On official letter-head of the bidder)
 To be signed by the
 Chief Executive of the
 Bidding company or a representative duly
 Authorized by abroad resolution.

INTEGRITY AND ETHICS UNDERTAKING FOR BIDDING

Dated: _____

We hereby commit and undertake to observe the following principles during our participation in the tender process and during the contract execution.

- a) That we will not directly or through any other person or firm, offer promise or give to any of the employees of OGDCL involved in or relevant to the execution of the contract any gain, pecuniary benefit or facilitation payment in order to obtain in exchange any advantage of any kind whatsoever during the execution of contract or at any stage thereafter.
- b) That we did not enter with any other bidders into any undisclosed agreement or understanding either formal or informal to restrict competitiveness sort to cartelize in the bidding process.
- c) That we will ensure that the remuneration of agents (if engaged) is appropriate and for legitimate services only.
- d) That we will not use subcontracts, purchase orders or consulting agreements as means of channeling payments to employees of OGDCL.
- e) That we will not and have not committed any offence under the Pakistan Panel Code, Prevention of Corruption Act or National Accountability Ordinance to achieve any advantage, gain or benefit during the tender process or the execution of contract.



We further understand and acknowledge that any violation or transgression of the above mentioned principles will attract disqualification from the tender process and may also result in permanent exclusion from further contract award processes.

We also accept and understand to respect and uphold OGDCL's absolute right to resort to and impose such disqualification, debarment or execution.

For and on behalf of _____

Tender No. _____

ANNEXURE - X

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-X	

ANNEXURE - X

DEVIATION FORM

Bidder: _____

Date: _____

List of Minor Deviations:



Sr. No.	Title/Description of Deviation	Tender document reference	Proposed change	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Bidder's Signature: _____

Name & Designation: _____

Affix seal of Bidder's company:

ANNEXURE - XI



	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XI	

ANNEXURE - XI

DETAILS OF AVAILABLE EQUIPMENT AND MACHINERY

(Details to Be Filled by The Bidder)

ANNEXURE - XII



	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XII	

ANNEXURE - XII

FORMAT OF CURRICULUM VITAE (CV) FOR KEY PERSONNEL

Name of Staff:		Current Title of Position:	
Date of Birth:		Nationality:	
Years with Firm:			
Membership in Professional Societies:			
Education:			
Year	Degree / Diploma	Discipline	Institute
Employment Record:			
Starting with present position, list in reverse order every employment held in the following format.			
Period	Name & Location of Employer	Position Held	Experience Details;
Languages:			
Indicate proficiency in speaking, reading and writing of each language as excellent, good, fair or poor.			
Language	Speaking	Reading	Writing
1)			
2)			
3)			

ANNEXURE - XIII

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XIII	

ANNEXURE - XIII

SCHEDULE RATE FOR ADDITIONAL WORKS

The Schedule rates for Additional Works shall not be the part of commercial evaluation, OGDCL shall only pay the PC Contractor for any additional works (if required) in accordance with the rates as provided below.

SCHEDULE OF RATES FOR ADDITIONAL WORK

Item No.	Pipe Size	Sch.	Material/Type of Weld	Description	Rate/ Dia-Inch (Rs.)	Total Rate/ Joint (Rs.)
A1. Welded & Threaded Joints (Including Installation)						
1	Ø ½"	80	A-106 Gr. B, SW	Welding Joints for Pipes		
2	Ø ½"	160	A-106 Gr. B, SW	Welding Joints for Pipes		
3	Ø ¾"	80	A-106 Gr. B, SW	Welding Joints for Pipes		
4	Ø ¾"	160	A-106 Gr. B, SW	Welding Joints for Pipes		
5	Ø 1"	80	A-106 Gr. B, SW	Welding Joints for Pipes		
6	Ø 1"	160	A-106 Gr. B, SW	Welding Joints for Pipes		
7	Ø 1½"	80	A-106 Gr. B, SW	Welding Joints for Pipes		
8	Ø 2"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
9	Ø 2"	160	A-106 Gr. B, BW	Welding Joints for Pipes		
10	Ø 3"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
11	Ø 4"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
12	Ø 4"	40	A-106 Gr. B, BW	Welding Joints for Pipes		
13	Ø 6"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
14	Ø 8"	40	A-106 Gr. B, BW	Welding Joints for Pipes		
15	Ø 8"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
16	Ø 10"	40	A-106 Gr. B, BW	Welding Joints for Pipes		
17	Ø 10"	80	A-106 Gr. B, BW	Welding Joints for Pipes		
1	Ø ½"	80	A-333 Gr. 6, SW	Welding Joints for Pipes		
2	Ø ½"	160	A-333 Gr. 6, SW	Welding Joints for Pipes		
3	Ø ¾"	80	A-333 Gr. 6, SW	Welding Joints for Pipes		
4	Ø ¾"	160	A-333 Gr. 6, SW	Welding Joints for Pipes		
5	Ø 1"	80	A-333 Gr. 6, SW	Welding Joints for Pipes		
6	Ø 1"	160	A-333 Gr. 6, SW	Welding Joints for Pipes		
7	Ø 1½"	80	A-333 Gr. 6, SW	Welding Joints for Pipes		
8	Ø 2"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
9	Ø 2"	160	A-333 Gr. 6, BW	Welding Joints for Pipes		
10	Ø 3"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
11	Ø 4"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
12	Ø 4"	40	A-333 Gr. 6, BW	Welding Joints for Pipes		
13	Ø 6"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
14	Ø 8"	40	A-333 Gr. 6, BW	Welding Joints for Pipes		
15	Ø 8"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
16	Ø 10"	40	A-333 Gr. 6, BW	Welding Joints for Pipes		
17	Ø 10"	80	A-333 Gr. 6, BW	Welding Joints for Pipes		
18	Ø ¾"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
19	Ø ¾"	160S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
20	Ø ¾"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
21	Ø ½"	160S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
22	Ø 1½"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
23	Ø 1½"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
24	Ø 1½"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
25	Ø 1"	160S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
26	Ø 1"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		

SCHEDULE OF RATES FOR ADDITIONAL WORK

Item No.	Pipe Size	Sch.	Material/Type of Weld	Description	Rate/Dia-Inch (Rs.)	Total Rate/ Joint (Rs.)
27	Ø 1"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
28	Ø 2"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
29	Ø 2"	160S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
30	Ø 2"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
31	Ø 3"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
32	Ø 3"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
33	Ø 4"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
34	Ø 4"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
35	Ø 6"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
36	Ø 8"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
37	Ø 8"	10S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
38	Ø 10"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
39	Ø 10"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
40	Ø 12"	40S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
41	Ø 12"	80S	ASTM A-312 Gr.TP-314/304L ASME B36.10	Welding Joints for Pipes		
A2. Valve Installation						
1	Ø ¾"	–	SW	Inst. of Gate/Ball Valves	Nos.	
2	Ø 1"	–	SW	Inst. of Gate/Ball Valves	Nos.	
3	Ø1½"	–	SW	Inst. of Gate/Ball Valves	Nos.	
4	Ø 2"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
5	Ø 3"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
6	Ø 4"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
7	Ø 6"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
8	Ø 8"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
9	Ø 10"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
10	Ø 12"	–	Flanged End	Inst. of Gate/Ball Valves	Nos.	
11	Ø ¾"	–	SW	Inst. of Globe/Check Valves	Nos.	
12	Ø 1"	–	SW	Inst. of Globe/Check Valves	Nos.	
13	Ø1½"	–	SW	Inst. of Globe/Check Valves	Nos.	
14	Ø 2"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
15	Ø 3"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
16	Ø 4"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
17	Ø 6"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
18	Ø 8"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
19	Ø 10"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
20	Ø 12"	–	Flanged End	Inst. of Globe/Check Valves	Nos.	
A3. Removal & Application of Insulation						
1	–	–	–	Removal and application of insulation, including cladding, required for the modification of piping/equipment	ft ²	

ANNEXURE - XIII**SCHEDULE OF RATES FOR ADDITIONAL WORK**

A4. Radiography					
S.No.	Material	Size	Designation/ Weight	Rate/Dia- Inch (Rs.)	Total Rate/ Joint (Rs.)
1*	A-106 Gr. B, SW	Ø ½"	80		
2*	A-106 Gr. B, SW	Ø ½"	160		
3*	A-106 Gr. B, SW	Ø ¾"	80		
4*	A-106 Gr. B, SW	Ø ¾"	160		
5*	A-106 Gr. B, SW	Ø 1"	80		
6*	A-106 Gr. B, SW	Ø 1"	160		
7*	A-106 Gr. B, SW	Ø 1½"	80		
8*	A-106 Gr. B, BW	Ø 2"	80		
9*	A-106 Gr. B, BW	Ø 2"	160		
10*	A-106 Gr. B, BW	Ø 3"	80		
11*	A-106 Gr. B, BW	Ø 4"	80		
12*	A-106 Gr. B, BW	Ø 4"	40		
13*	A-106 Gr. B, BW	Ø 6"	80		
14*	A-106 Gr. B, BW	Ø 8"	40		
15*	A-106 Gr. B, BW	Ø 8"	80		
16*	A-106 Gr. B, BW	Ø 10"	40		
17*	A-106 Gr. B, BW	Ø 10"	80		
18	A-106 Gr. B, SW	Ø ½"	80		
19	A-106 Gr. B, SW	Ø ½"	160		
20	A-106 Gr. B, SW	Ø ¾"	80		
21	A-106 Gr. B, SW	Ø ¾"	160		

ANNEXURE - XIII**SCHEDULE OF RATES FOR ADDITIONAL WORK**

A4. Radiography					
S.No.	Material	Size	Designation/ Weight	Rate/Dia- Inch (Rs.)	Total Rate/ Joint (Rs.)
22	A-106 Gr. B, SW	Ø 1"	80		
23	A-106 Gr. B, SW	Ø 1"	160		
24	A-106 Gr. B, SW	Ø1½"	80		
25	A-106 Gr. B, BW	Ø 2"	80		
26	A-106 Gr. B, BW	Ø 2"	160		
27	A-106 Gr. B, BW	Ø 3"	80		
28	A-106 Gr. B, BW	Ø 4"	80		
29	A-106 Gr. B, BW	Ø 4"	40		
30	A-106 Gr. B, BW	Ø 6"	80		
31	A-106 Gr. B, BW	Ø 8"	40		
32	A-106 Gr. B, BW	Ø 8"	80		
33	A-106 Gr. B, BW	Ø 10"	40		
34	A-106 Gr. B, BW	Ø 10"	80		
35	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø ¾"	80S		
36	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø ¾"	160S		
37	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø ¾"	40S		
38	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø ½"	160S		
39	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø1½"	80S		
40	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø1½"	40S		
41	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø1½"	80S		
42	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 1"	160S		
43	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 1"	80S		

ANNEXURE - XIII**SCHEDULE OF RATES FOR ADDITIONAL WORK**

A4. Radiography					
S.No.	Material	Size	Designation/ Weight	Rate/Dia- Inch (Rs.)	Total Rate/ Joint (Rs.)
44	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 1"	40S		
45	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 2"	80S		
46	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 2"	160S		
47	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 2"	40S		
48	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 3"	80S		
49	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 3"	40S		
50	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 4"	40S		
51	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 4"	80S		
52	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 6"	40S		
53	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 8"	40S		
54	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 8"	10S		
55	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 10"	40S		
56	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 10"	80S		
57	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 12"	40S		
58	ASTM A-312 Gr.TP-314/304L ASME B36.10	Ø 12"	80S		
A5. Heat Treatment					
S.No.	Material	Size	Designation/ Weight	Rate/Dia- Inch (Rs.)	Total Rate/ Joint (Rs.)
1	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 12"	STD		
2	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 8"	80		
3	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 6"	80		
4	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 3"	80		
5	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 2"	80		
6	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 4"	STD		
7	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 3"	STD		

SCHEDULE OF RATES FOR ADDITIONAL WORK**A4. Radiography**

S.No.	Material	Size	Designation/ Weight	Rate/Dia- Inch (Rs.)	Total Rate/ Joint (Rs.)
8	ASTM A-106 Gr.B, B.E, AS PER ANSI B36.10 (NACE)	Ø 2"	STD		
9	ASTM A-106 Gr.B, P.E, AS PER ANSI B36.10 (NACE)	Ø 1-1/2"	160		
10	ASTM A-106 Gr.B, P.E, AS PER ANSI B36.10 (NACE)	Ø 1"	160		
11	ASTM A-106 Gr.B, P.E, AS PER ANSI B36.10 (NACE)	Ø 1/2"	160		
12	ASTM A-106 Gr.B, P.E, AS PER ANSI B36.10 (NACE)	Ø 3/4"	160		
13	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 8"	Sch. 80S		
14	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 6"	Sch. 40S		
15	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 8"	Sch. 120		
16	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 6"	Sch. 120		
17	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 4"	Sch.40S		
18	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 3"	Sch.40S		
19	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 2"	Sch.40S		
20	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 1-1/2"	Sch.40S		
21	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 1-1/2"	Sch. 120		
22	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 1"	Sch.40S		
23	PIPE,ASTM A312 TP 304/304L DUAL GRADE ASME B36.19 (NACE)	Ø 3/4"	Sch.40S		

NOTES:

- 1) *Welding shall include cutting and end preparation for the modification of installed piping.*
- 2) *For single piping flange dismantling/removal, half of the above rate.*
- 3) *Process piping which requires NACE MR-0175/ ISO 15156 compliance as mentioned in BOQ above shall be heat treated as per ASME section VIII to achieve the required hardness of welding joints.*
- 4) *All piping shall fulfill the requirements of NACE MR-0175/ ISO 15156. Accordingly heat treatment where required shall be performed as per ASME section VIII to achieve the required hardness of welding joints.*

SCHEDULE OF RATES FOR ADDITIONAL WORK

S.No.	Items	Unit	Unit Rate (Pak Rs.)
B	Manpower		
1	Mechanical Engineer	Hour	
2	Piping Engineer	Hour	
3	Electrical Engineer	Hour	
4	Instrument Engineer	Hour	
5	Control Engineer	Hour	
6	Civil / Structural Engineer	Hour	
7	Site Project Engineer	Hour	
8	Material Coordinator	Hour	
9	Safety Supervisor	Hour	
10	Foreman/Supervisor/Superintendent	Hour	
11	RT Supervisor	Hour	
12	Radiographer	Hour	
13	PWHT Supervisor	Hour	
14	PWHT Operator	Hour	
15	PWHT Technician	Hour	
16	Crane Driver	Hour	
17	Excavator Driver	Hour	
18	Argon Welder	Hour	
19	Electric Welder	Hour	
20	Structure Welder	Hour	
21	Rigger	Hour	
22	Fitter	Hour	
23	Assistant Fitter	Hour	
24	Fabricator	Hour	
25	Sand Blaster Supervisor/ Helper	Hour	
26	Crane Operator	Hour	
27	Generator Operator/ Engine Driver	Hour	
28	Electrician	Hour	
29	Instrument Fitter	Hour	
30	Instrument Technician	Hour	
31	Mason	Hour	
32	Helper	Hour	

SCHEDULE OF RATES FOR ADDITIONAL WORK

S.No.	Items	Unit	Unit Rate (Pak Rs.)
C	Equipment		
1	Crane - 110 Tons	Hour	
2	Crane - 60 Tons	Hour	
3	Crane - 50 Tons	Hour	
4	Crane - 25 Tons	Hour	
5	Crane - 06 Tons	Hour	
6	Truck (with Mounted Crane)	Hour	
7	Truck	Hour	
8	Concrete Mixer	Hour	
9	Vibrator	Hour	
10	Roller	Hour	
11	Plate Compactor	Hour	
12	Water Tanker	Hour	
13	Level	Hour	
14	Theodolite	Hour	
15	Argon Welding Machine	Hour	
16	Welding Machine	Hour	
17	Welding Plant (Diesel) 300-400 Amp.	Hour	
18	Gas Cutting Machine	Hour	
19	Lathe Machine	Hour	
20	Chain Block 5 Tons	Hour	
21	Chain Block 10 Tons	Hour	
22	Jack 10 Tons	Hour	
23	Fill Pump 4"	Hour	
24	Hydrotest Test Pump with calibrated gauges etc.	Hour	
25	Compressor - 650 Cfm	Hour	
26	Power Generator - 350 KW	Hour	
27	Power Generator - 150 KVA	Hour	
28	Power Generator - 100 KVA	Hour	
29	Power Generator - 50 KVA	Hour	
30	Power Generator - 30 KVA	Hour	
31	Grinder	Hour	



SCHEDULE OF RATES FOR ADDITIONAL WORK

S.No.	Items	Unit	Unit Rate (Pak Rs.)
32	Holiday Detector	Hour	
33	Fork Lifter - 05 Tons	Hour	
34	Excavator - 1 cu.M - Hitachi or equivalent	Hour	
35	Rammers & Compactors - PRIMA model ST.	Hour	
36	Tractor and Trailers	Hour	
37	Trailer 16 wheels	Hour	
38	Tractor Trailer FEAT 22	Hour	
39	Angle grinder 09 deg, 05 deg	Hour	
40	Auto gas berel cutter set pipe	Hour	
41	Power cutter pipe	Hour	
42	Air compressor	Hour	
43	Sand tank	Hour	
44	Air tank	Hour	
45	Diesel tank	Hour	
46	Sand blasting accessories	Hour	
47	Office container 40' and 20'	Hour	
48	Vehicle double/single door	Hour	
49	Car	Hour	
50	Lorries - 10 ton	Hour	
51	Gamma rays source	Hour	
52	Equipment with accessories	Hour	
53	PWHT Machines Accessories	Hour	

Notes:

1. Abover rates are applicable to normal and as well as overtime
2. Unit rates quoted shall include mobilization and demobilization
3. Duration for which manpower or machinery & equipment present at site shall be chargeable after verification by OGDCL/Engineering Consultant.

ANNEXURE - XIV

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XIV	

ANNEXURE -XIV

DATA SUMMARY SHEET

Following information regarding each item must be stated categorically:

COMPLETE NAME AND ADDRESS OF BIDDER

COMPLETE NAME AND ADDRESS OF BENEFICIARY OF L/C

ADDRESS OF BANKER WITH ACCOUNT NO.

COUNTRY OF ORIGIN

VALIDITY OF BID

COMPLETION PERIOD

AMOUNT OF BID BOND

NAME AND ADDRESS OF LOCAL AGENT IN PAKISTAN (IF ANY) _____

CONFIRMATION THAT QUOTED PRICE IS FIRMED/FIXED AND NOT BASED ON ANY PRICE ADJUSTABLE FORMULA / ANY ESCALATION



Yes _____ No _____

CHECKLIST:

1. HAVE YOU COMPLETED THE BID PRICE SCHEDULE Yes _____ No _____

Sign & Seal

ANNEXURE - XV

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XV	

ANNEXURE-XV

Mandatory for participation in Bidding Process

AFFIDAVIT

I,.....S/o..... aged.....years, working as Proprietor/Managing Partner/ Director of M/s.....having its registered office at..... do hereby solemnly affirm and declare on oath as under :

1. That I am competent to swear this affidavit being proprietor/one of the partners/ Director of M/s.....
2. That M/s.....is a proprietorship/partnership firm/company is participating in tender process conducted by OGDCL.
3. That I hereby confirm and declare that none of my/ our group/ sister concern/ associate company is participating/ submitting this tender.
4. That I hereby confirm and declare that my/our firm/company M/s..... and my/ our firm/ group/ company/ sister concern / associate company have not been black listed/ de-listed any Institutional agencies/ Govt. Deptt./ Public Sector Undertaking.
5. That there is no change in the Name & Style, Constitution and Status of the firm, after Pre-qualification.
6. That I further undertake that in case any of the facts contained above and in our application is found other-wise or incorrect or false at any stage. my/our firm/ company/ group/sister concerns/ associate companies shall stand debarred from the present and future tenders of the OGDCL.


(Signature of the Proprietor/ Managing Partner/Director with Seal)

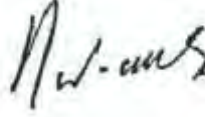

DEPONENT

Verified at on..... that the contents of paras 1 to 6 of this affidavit are true and correct to best of my knowledge and no part of this is false and nothing material has been concealed or falsely stated therein.



(Signature of the Proprietor/ Managing Partner/ Director with Seal)

DEPONENT

(Signature & Seal of Notary) 

ANNEXURE - XVI

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XVI	

ANNEXURE - XVI

PERFORMANCE BANK GUARANTEE

Oil & Gas Development Company Limited
 OGDCL House, Jinnah Avenue, Blue Area,
Islamabad (Pakistan)



Guarantee No.....
 Date of issue.....
 Date of expiry.....
 Amount.....

Dear Sir,

Ref; our Bank Guarantee No. _____ in the sum of _____ Account
 _____ Amount of Contract/Job.

In consideration of you having entered into Contract No. _____ Dated
 _____ with _____ called PC Contractor and in
 consideration of value received from PC Contractor. We hereby agree and undertake as
 followings:

1. To make unconditional immediate and forthwith payment to you as called upon of an amount equivalent to (10%) ten percent of the Contract value of the contract price mentioned in the said contract in Pak. Rupees, on your written FIRST and SIMPLE demand without further recourse, question, query, deferment contestation or reference to PC Contractor or any other person in the event of default, non-performance or non-fulfillment by PC Contractor of his obligations, liabilities, responsibilities under the said contract of which you shall be the sole judge.
2. To accept written intimation from you as conclusive, sufficient and final evidence of the existence of the default or breach as aforesaid on the part of PC Contractor and to make payment immediately and forthwith upon receipt of your FIRST and SIMPLE written demand.
3. The Performance Bond shall remain valid and in full force and effect up to _____ or issue of statement of discharge by your authorized representative or return of original guarantee whichever is earlier.
4. That no grant of time or other indulgence to, amendment in the terms of the Contract by Agreement between the parties, or imposition of Agreement with PC Contractor in respect of the performance of his obligations under pursuance of the said Agreement, with or without notice to us, shall in any manner discharge or otherwise affect this Guarantee and our liabilities and commitments there under.
5. This is an independent and direct obligation guarantee and shall be binding on us and our successors interest and shall be Irrevocable.



	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XVI	

6. This guarantee shall not be affected by any change in the constitution of the Guarantor Bank or the constitution of the PC Contractor.

7. The Guarantor Bank Warrants and represents that it is fully authorized, empowered and competent to issue this guarantee.

Authorized sign for Issuing Bank

(Seal of Bank)



	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Annexure-XVI	

OIL & GAS DEVELOPMENT COMPANY LIMITED

List of Banks allowed for Bank Guarantees



Sr. No.	Bank Name
1	ALLIED BANK
2	ASKARI BANK
3	BANK AL HABIB
4	BANK ALFALAH LTD
5	FAYSAL BANK
6	HABIB BANK LTD
7	HABIB METROPOLITAN BANK
8	MEEZAN BANK LIMITED
9	MCB BANK
10	NATIONAL BANK OF PAKISTAN
11	STANDARD CHARTERED BANK
12	UNITED BANK LTD

SCHEDULE - A

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Schedule - A	

PREAMBLE TO BILL OF QUANTITIES

1. The items mentioned in the Bill of Quantities consist of furnishing all plant, labor, equipment, machinery, consumables and materials for completing the entire work scope. The work shall be done, complete in all respects in accordance with Specifications and Drawings (attached in Section-III and Volume-II of the document herein) within the stipulated time frame.
2. The Contractor shall be responsible for carrying out all work, complete in all respects, in accordance with the drawings, specifications and other conditions of contract without extra cost to the Owner. Any item of work required for completion but not expressly indicated in the Bill of Quantities shall be deemed to have been included in the unit rates quoted by the Contractor.
3. The Quantities contained in the Bill of Quantities for each work are estimated and liable to change (increase, decrease or omitted) when the work is actually executed. The Owner does not expressly or by implication guarantee that actual quantities of work to be performed will correspond to BOQ quantities. The payment to be made to the Contractor shall be based on the actual quantity of work performed.
4. The prices and rates to be quoted in the Bill of Quantities are to be full inclusive value of the Works described under specified items including all costs and expenses which may be required in and for the construction of the Works described, together with all risks, liabilities and obligations set forth and implied in all the documents referred to on which the tender is based. Rates and prices quoted by bidder shall be firm for the duration of the Contract. No extra payments on account of escalation in prices due to any reason, whatsoever, shall be admissible, unless specified elsewhere.
5. Unit rate is to be entered against each item in the Bill of Quantities where quantities are non-entered. Items against which no price or rate is quoted in the BOQ shall be deemed to have been covered by rates or prices quoted in other BOQ items.
6. The BOQ shall be read in conjunction with conditions of contract, technical specification and the drawings.
7. The nomenclature used in BOQ is for identification of work only and is not intended to describe the complete work under that item which should be developed from Drawings, Specifications, Scope of Work and Conditions of Contract.
8. The contractor shall be responsible for arranging electricity and potable water for construction purposes at his own cost, inclusive of safety and security of the manpower, site Material, Transportation, handling and storage etc.
9. The works are to be carried out on a fast track basis therefore it is essential that the contractor shall be prepared to execute the work round the clock including Sundays and Holidays.
10. Any surplus or scrap materials remaining after the execution of work shall be reconciled and handed over to the Owner.

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-003	Schedule - A	

SCHEDULE - A

BOQ / PRICE SCHEDULE

**SUPPLY / INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF MISCELLANEOUS
EQUIPMENTS WORKS FOR MARU-RETI COMPRESSION PROJECT**

The Bidders are requested to submit duly initialed and stamped copy of blank BOQ/Price Schedule as part of Technical Proposal (Please do not fill in prices).

The duly filled, initialed and stamped BOQ/Price Schedule shall be submitted along with soft copy as part of the Commercial Proposal.

The Material shall only be Procured (supplied) from approved vendors as attached below. The PC Contractor shall warrant seamless operation of its procured material during the warranty period and shall be responsible to check/inspect/test the equipment/material after procurement.

PRICE SUMMARY TABLE



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
COMPLETE PRICE SUMMARY
TABLE



DOC. NO. : 0504196-PST-001
 PREP. : IM
 REV. : 0
 DATE : 24-03-2021

SR #	ITEM DESCRIPTION	(1)	(2)	(3)	(4 = 1+2+3)	Remarks
		Amount in PKR	Applicable GST	Applicable SST	Total inclusive of all applicable taxes and duties	
A	TOTAL CONSTRUCTION, FABRICATION, INSTALLATION/ERECTION WORKS COST FOR MARU-RETI COMPRESSION PROJECT (A.1 + A.2 + A.3)					
A.1	<p><u>MECHANICAL WORKS</u> (Works include but not limited to transportation, Fabrication, Installation, Erection, Testing of all Off-skid piping, valve, fittings etc, as well as assembly, Testing, pre-commissioning and commissioning assistance for Compressor, Separator package as well as complete Electrical/instrumentation, Mechanical modification/integration works required for the seamless operation of the Maru-reti Plant, including all operations such as, but not limited to, verification that the installation conforms to plans, specifications and approved drawings, testing and operation of all equipment, flushing and hydrotesting of all pipings, fill of initial lubes/oils, nitrogen purging and system leak test with process gas, calibration of instruments, functional testing of instrumentation and control system, electrical equipment and systems, F&G, etc, transportation (from holding location to equipment/package foundation) of all loose shipped items/equipment included with the compressor package as per the drawings/documents/specification/datasheets/lists/BOQs attached in the complete Volume-I and Volume-II of the Tender document. It also includes hook-up of compressor package, Separator Packages with the existing plant as well as completion of all modification/integration works required for the seamless operation of the Plant. Refer to Volume-I Section-III (Including all Annexures) and Section-II (Schedule-A), Complete Volume-II of the Tender document for true depiction of the complete works</p>					
A.2	<p><u>CIVIL WORKS</u> (Civil Construction and Steel Structural works for Separator Packages, Compressor Package, Crossovers, Evaporation pit, Vent stack structure, all type of foundations, pipe supports, drain pits, light poles foundation, F&G, electrical structures foundations, including but not limited to supply of outsource soil (for engineered fill, sand fill, stone soling), cement, aggregates (fine & coarse), fresh water, formworks, steel reinforcement, Epoxy and non-shrinkage grout, bitumen for coating, steel embedded parts (lugs, Galvanized anchor bolts, hilti bolts, Ms plates, grating, chequered plates), brick or masonry, steel structures as per referred drawings. Installation and construction of structural & civil works including excavation, dewatering with water disposal, leveling, grading of plot, laying of filling material(engineered fill, sand fill, stone soling), disposal of excavated material to specified location by client, compaction upto the desired density, formwork fixing, steel reinforcement(cutting, fixing, PCC), PCC & RCC works (mixing, pouring, curing), grouting, fabrication & installation of steel embedded parts, fabrication & installation of steel structure (lifting, shifting, painting & erection), Masonry and plaster works. All the material & construction works shall be in compliance with project drawings/documents/specifications/BOQs as provided in the Volume-I and Volume-II of the Tender Document).</p>					



**OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
COMPLETE PRICE SUMMARY
TABLE**



DOC. NO. : 0504196-PST-001
PREP. : IM
REV. : 0
DATE : 24-03-2021

SR #	ITEM DESCRIPTION	(1)	(2)	(3)	(4 = 1+2+3)	Remarks
		Amount in PKR	Applicable GST	Applicable SST	Total inclusive of all applicable taxes and duties	
A.3	ELECTRICAL AND INSTRUMENTATION WORKS (Works shall include but not limited to Supply and Installation of Lightening Protection system, lightning arrester with suitable conductor and Earth rod along with separate earth pits for Lightning arresters, Earthing, Grounding including Construction and installation of earth pits with covers, earth bars, and earthing mesh, with suitable conductor and Earth rod, installation of Generator (Supplied by Compressor Package vendor) along with cable laying, installation, termination, checking, loop checking, glanding of power cables (Supplied by Compressor packager) from Generators to Electrical Distribution board at Compressor Package, ESD push button at Maru-1 main gate along with fabrication, installation of supports for ESD push button, Installation, laying of cables in cable trays and buried, termination, mounting structure, Glanding, Loop Checking, testing, alignment, bolting of Fire and Gas Detectors supplied by Compressor's OEM complete in all aspects including civil works required for the Installation of Detectors at Compressor, Laying, termination, Glanding, Grounding of Lighting fixtures for area lighting, Lighting Junction Boxes, Breakers, DBs, Lighting Cables from lighting fixtures to Lighting Junction boxes and Junction Boxes to Electrical power source as specified in the documents/drawings/BOQs/specification/ datasheets attached in Volume-I and Volume-II of the Tender Document)					
B	TOTAL PROCUREMENT COST FOR MARU-RETI COMPRESSION PROJECT (B.1 + B.2)					
B.1	PIPING BULK MATERIAL PROCUREMENT COST (This Includes the cost of procuring bulk piping material detailed in the mechanical procurement BOQ attached in Volume-I, Section-II, Schedule-A of the tender document. The procurement cost is inclusive of, but not limited to shipping cost, taxes, withholding costs, logistics Procurement services, inspection, expediting services, coordination, acceptance, forwarding, payment of legal taxes and fees, payment of customs duty, customs clearance of equipment as well as complete transportation to site within project schedule and with complete compliance to the project specifications/datasheets/vendor list/requirements as set out in the Tender Document.)					
B.2	ELECTRICAL AND INSTRUMENTATION BULK MATERIAL PROCUREMENT COST (This Includes the cost of procuring bulk Electrical and instrumentation material detailed in the E&I procurement (supply) BOQ attached in Volume-I, Section-II, Schedule-A of the tender document. The procurement cost is inclusive of, but not limited to shipping cost, taxes, withholding costs, logistics Procurement services, inspection, expediting services, coordination, acceptance, forwarding, payment of legal taxes and fees, payment of customs duty, customs clearance of equipment as well as complete transportation to site within project schedule and with complete compliance to the project specifications/datasheets/vendor list/requirements as set out in the Tender Document.)					



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
COMPLETE PRICE SUMMARY
TABLE



DOC. NO. : 0504196-PST-001
PREP. : IM
REV. : 0
DATE : 24-03-2021

SR #	ITEM DESCRIPTION	(1)	(2)	(3)	(4 = 1+2+3)	Remarks
		Amount in PKR	Applicable GST	Applicable SST	Total inclusive of all applicable taxes and duties	
C	Subtotal (A+B)					
TOTAL PROJECT COST (AMOUNT IN PKR)					(C4)	

Notes:

1. OGDCL shall not be liable for any increase in costs stated above for the entire duration of the project regardless of any reason whatsoever.
2. The Payment of Supply & Services by the PC contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.



CONSTRUCTION BOQs



OIL AND GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
BILL OF QUANTITIES
FOR
MECHANICAL WORKS



DOC. NO. : 0504196-BOQM-102
 PREP. : S.US
 REV. : 0
 DATE : 01-02-2021

SR#	ITEM DESCRIPTION	UNIT	QTY.	UNIT RATES (PKR)	AMOUNT IN Rs.	REMARKS
A	MECHANICAL WORKS:					
1.0	FABRICATION & WELDING					
1.1	Fabrication & Welding / Threading including cutting, beveling and grinding of different sizes dia.					
i	3/4	Dia Inch	32			
ii	1-1/2	Dia Inch	5			
iii	2	Dia Inch	100			
iv	3	Dia Inch	5			
v	4	Dia Inch	100			
vi	6	Dia Inch	320			
vii	8	Dia Inch	1200			
	a Receiving, Loading, transportation, unloading of pipes, fittings and allied material at site. b Erection of pipes, fitting and allied material at site. c Welding of the piping as per qualified procedures and NDT as per relevant specification d Welding of flanges on both ends of the piping. e All Consumables and any work required for completion f Area must be cleared and re-instated after completion of work					
2.0	INSTALLATION / TIGHTENING OF VALVES					
2.1	Installation of Valves different Dia such as 3/4" dia, 2" dia, 6" dia, 8" dia.	No.	30			
i	Receiving, Loading, transportation, unloading of Valves and allied material at site.					
ii	Erection of Valves at site.					
iii	Mechanical bolt up complete in all respect as per flange rating requirements.					
3.0	PAINTING OF SURFACE PIPING					
3.1	Sand Blasting including primer painting (2 coats).					
3.2	Paint and primer of surface piping to be supplied	Sq. m	225			
4.0	HYDROSTATIC TESTING:					
4.1	Hydrostatic testing of pipeline as per project specification and Client requirements. Contractor shall provide all material, tools, equipment, supply of water, temporary test plugs, couplings, flanges, nuts, bolts, recorder gauge, cleaning and flushing and all necessary arrangements required for hydrostatic testing would be responsibility of contractor and should be done as per provided specification, Code & standard.					
i	3/4"	m	100			
ii	1-1/2"	m	2			
iii	2"	m	100			
iv	4"	m	50			
v	6"	m	50			
vi	8"	m	220			



OIL AND GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
BILL OF QUANTITIES
FOR
MECHANICAL WORKS



DOC. NO. : 0504196-BOQM-102
PREP. : S.US
REV. : 0
DATE : 01-02-2021

SR#	ITEM DESCRIPTION	UNIT	QTY.	UNIT RATES (PKR)	AMOUNT IN Rs.	REMARKS
5.0	INSTALLATION/ASSEMBLY & PRE-COMMISSIONING & COMMISSIONING OF COMPLETE WORKS/EQUIPMENT					
5.1	Installation of skids and equipment includes but not limited to leveling, alignment and anchoring on foundation. Contractors is also responsible for all inter-connected piping, pipe support and jewelries. Works also include but not limited to assembling of all loose shipped items as attached in Volume-II of the Tender document with installation/erection, assembling, pre-commissioning and Commissioning assistance complete in all aspects and as per the requirements of the project.					
a	The Compressor package has a total of 5 skids, which are Main Skid, Pipeline Skid, Scrubber Skid, Air Cooler Structure Skid and generator skid. PC Contractor's works shall include but not limited to transportation/assembly/installation/erection & provide pre-commissioning/commissioning assistance for the complete compressor package including all loose shipped items/structure/components complete in all aspects and to accommodate seamless operation of the Compressor package, as provided in the List of Loose shipped items/Vendor drawings etc. attached in Volume-II , as per the instructions of OEM and to the satisfaction of the COMPANY/CONSULTANT.			Lump Sum		
b	PC Contractor's works shall include by not limited by complete transportation/installation/erection of the HP Separator skid (Refer to HP separator GA) as attached in Volume-II of the document herein.					
TOTAL COST (AMOUNT IN PKR) (A.1)						

Notes:

1. The quantity of works in this document is estimated, The cost of all Mechanical works shall be paid to the PC Contractor as per actual work done on site.
2. The Payment of Services by the PC Contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.
3. The Estimation of the Actual work done on site shall be carried out and approved by OGDCL/Consultant's Representative present on site.
4. The PC Contractor shall be responsible for considering/building all costs required for the completion of works in accordance with the specifications/datasheets/drawings/documents provided in the Tender document. Any increase in cost due to Failure of the PC Contractor to consider/identify/build all costs pertaining to the completion of the Works outlined above shall be at the PC Contractor's own expense.
5. Any works if Sub-Contracted by the PC Contractor shall not relieve the PC contractor of his duty to perform the works with due diligence. PC Contractor shall be responsible for the costs incurred due to the irresponsible/unprofessional works of the Sub-Contractor.
6. OGDCL shall not be liable for any increase in unit rates/cost for the entire duration of the project regardless of any reason whatsoever.



OIL AND GAS DEVELOPMENT COMPANY LTD.
MARU RETI COMPRESSION PROJECT
BILL OF CONSTRUCTION
FOR CIVIL WORKS



DOC. No. : 0504196-CIV-CE-001
PREP. BY : AS
REV. : 0
DATE : 01-02-21

SR#	Description	Qty.	Unit	Rate	Amount in Rs.
1.0	EXCAVATION				
	Excavation for foundation in all kinds of soil, dry or wet, hard or soft, including all operation, complete with breaking clods, leveling, dressing, dewatering, shoring & compacting. Include backfilling of suitable excavated earth also with clean sand where required i/c breaking clods, dressing, watering and consolidating by ramming in layers not exceeding 8" depth to obtain compaction as per instruction and specification of the Consultant and approval of Client (Site Engineer). Contractor will carryout compaction test as per specification with out any extra cost.	1904.0	m³		
2.0	NON-SHRINKAGE GROUT				
	Supply & laying of 25 mm thk. non-shrinkage grout, having minimum compressive strength of 40 N/mm ² in accordance with the Company specification, standard drawings and etc.	34.0	m²		
3.0	PLAIN CEMENT CONCRETE				
	Providing and laying Plain cement concrete of specified strength using approved quality 3/4" max. size graded crushed aggregate & fine aggregate including approved Steel formwork & its removal, all operations of vibrating, leveling, compacting and curing etc. complete as per specification & instruction of the Consultant. Note: 1. Portland cement should be used for all works. 2. Mix design for each type of sample will be provided by the Contractor	37.0	m³		
	PCC 1:4:8 (1 cement 4 sand and 8 coarse aggregate).				
4.0	REINFORCED CEMENT CONCRETE				
	Providing and laying Reinforced cement concrete shall be developed 28 days cylindrical strength of 3000psi specified, using approved quality 3/4" max. size graded crushed aggregate & fine aggregate including approved form work & its removal, all operations of vibrating, leveling, compacting and curing etc. complete but excluding the cost of steel as per specification & instruction of the Consultant. Note: 1. Sulphate resistant cement (Type-V) should be used for all sub-structure works. 2. Mix design for each type of sample will be provided by the Contractor	307.0	m³		



OIL AND GAS DEVELOPMENT COMPANY LTD.
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BILL OF CONSTRUCTION
FOR CIVIL WORKS



DOC. No. : 0504196-CIV-CE-001
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REV. : 0
DATE : 01-02-21

SR#	Description	Qty.	Unit	Rate	Amount in Rs.
5.0	STEEL REINFORCEMENT				
	Providing and laying hot rolled grade 460 steel reinforcement bars complying with BS-4449) including the cost of straightening, cutting, bending, binding, wastage and such overlaps as are not shown in drawings, placing in position on cement concrete 1:2:4 precast spacer block or M.S chairs, tying with binding wire (GI wire of 18 gauge), including cost of chairs and wires etc. in all kinds of RCC works.	12.7	tons		
	60 Ksi Deformed Steel Rebars				
6.0	STEEL EMBEDDED PARTS				
	Providing, fabricating and fixing of steel embedded parts in concrete such as M.S plates/ Lugs/ grating/Split-end tangs/ Lifting Hooks/ Holding down/Anchor bolts/ H.D. bolts type C and Nuts etc. Complete as per drawings, specifications and approval of Client.	1220.0	Kg		
	Anchor Bolts/Lugs/MS Plates/Grating				
7.0	STEEL STRUCTURE				
	Supply of material, fabrication, painting, erection, surface preparation of steel structure for Platforms and Crossovers etc. Complete as per drawings, specifications and approval of Client.	2650.0	Kg		
8.0	GRAVEL & COBBLE FILL MATERIAL				
	Providing and laying 150 mm thick each layer of Gravel, Cobbles & pebbles size containing coarse sand material before laying foundation filling voids with spawels, consolidating and compacting with mechanical means as per drawings, specifications and instruction of Consultant and approval of Client (Site Engineer).	15.0	m³		
9.0	GEOMEMBRANE				
	Providing and laying 0.75mm thick HDPE geomembrane with polylocks and extrusion weld as per drawing, instruction and specification of the Consultant and approval of Client (Site Engineer).	200.0	m²		
10.0	SAND FILL (A-3 SOIL)				
	Provide sand fill layers of A-3 sand material each having thickness of 200 mm directly under the foundation and should be compacted in layers upto 95% dry density. Contractor will carryout compaction test as per specification.	675.0	m³		



OIL AND GAS DEVELOPMENT COMPANY LTD.
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DATE : 01-02-21

SR#	Description	Qty.	Unit	Rate	Amount in Rs.
11.0	STONE SOLING				
	The stone soling shall be well graded broken hard stone range from boulders to coarse gravel size obtained from an approved quarry. The interstices of the whole surface of stone soling layer shall be filled with smaller size stones (including stone dust), so as to effectively fill in the voids and crevices watered, and again thoroughly rolled with the same roller to produce a smooth and even surface free from irregularities and true to line and level. The stone soling shall be laid and packed to even grades and compacting by using a vibratory roller to a consolidated thickness of not less than 150 mm or as shown on the drawings	160.0	m ³		
12.0	BITUMEN COATING				
	Supply & Laying 1200 micron thick 10/20 grade of bitumen for foundations after two coat of primer outside foundation upto finished ground level to sides of footings including cost of all material,labour,equipment etc complete as per drawing and specification and as directed by the Engineer Incharge.	87.0	m ²		
13.0	EPOXY GROUT				
	Supply & laying of 50 mm thk. Epoxy grout and filling in Pockets, having minimum compressive strength of 40 N/mm ² in accordance with the Company specification, Including preparation of pockets by means of soft wood or Thermopore sheet in foundations as per drawings, instruction and specification of the Consultant and approval of Client (Site Engineer).				
13.1	Surface Grout: 50mm thick	98.0	m ²		
13.2	Pocket Grout	4.0	m ³		
14.0	ENGINEERING FILL LAYER				
14.1	Provide one layers of engineering fill layers material of 200mm thickness each, directly under the foundation. Well graded granular mixture with no particles larger than 50mm and at least 80% of material are smaller than 19 mm in size. Materials passing sieve no.200 shall be less than or equal 12%	50.0	m ³		
TOTAL COST (AMOUNT IN PKR)				(A.2)	

Notes:

1. The quantity of works in this document is estimated, The cost of all Civil works shall be paid to the PC Contractor as per actual work done on site.
2. The Payment of Services by the PC contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.
3. The Estimation of the Actual work done on site shall be carried out and approved by OGDCL/Consultant's Representative present on site.
4. The PC Contractor shall be responsible for considering/building all costs required for the completion of works in accordance with the specifications/datasheets/drawings/documents provided in the Tender document. Any increase in cost due to Failure of the PC Contractor to consider/identify/build all costs pertaining to the completion of the Works outlined above shall be at the PC Contractor's own expense.
5. Any works if Sub-Contracted by the PC Contractor shall not relieve the PC contractor of his duty to perform the works with due diligence. PC Contractor shall be responsible for the costs incurred due to the irresponsible/unprofessional works of the Sub-Contractor.
6. OGDCL shall not be liable for any increase in unit rates/cost for the entire duration of the project regardless of any reason whatsoever.



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT
ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
E&I WORKS



DOC. NO. : 0504196-INS-BOQ-002
PREP. : STR
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
	CONSTRUCTION, PRE COMMISSIONING, COMMISSIONING AND INSTALLATION WORKS					
1.0	EARTHING WORKS					
1.1	Installation of 70 mm ² bare stranded Copper conductor.	Meter	180			
1.1.1	Installation of 35 mm ² bare stranded Copper conductor.	Meter	55			
1.1.2	Installation of Cable Crimp Connector ('C' Type) - 35mm ² - 70mm ²	Nos.	100			
1.1.3	Installation of Tin Copper Earthing Lugs for 70mm ² .	Nos.	50			
1.1.4	Installation of Tin Copper Earthing Lugs for 35mm ² .	Nos.	50			
1.1.5	Installation of Earth Pit with Cover.	Nos.	6			
1.1.6	Installation of Earth Rod Driving Stud	Nos.	6			
1.1.7	Installation of Saddle Clamp	Nos.	6			
1.1.8	Installation of 25mm dia 03m length Copper Clad Steel Earth Rod.	Nos.	6			
1.1.9	Installation of 06 way Copper Earth Bar	Nos.	4			
2.0	LIGHTENING PROTECTION SYSTEM					
2.1.1	Installation of Pure Copper lightning Arresters (minimum of 1.5 meter length) for lightning protection of Warehouse shed.	Nos.	2			
2.1.2	Installation of 2m per Arrester metal rod for arrester height extension as shown in detail drawing.	Nos.	2			
2.2	Copper Conductors					
2.2.1	Laying, Installation of earthing cable 1C x 120 mm ² PVC Covered Earthing Cable Green/Yellow	Mtr	50			
2.3	Lightning Grounding System					
2.3.1	Installation of Cable Crimp Connector ('C' Type) - 120mm ² - 120mm ² .	Nos.	100			
2.3.2	Installation of Tin Copper Earthing Lugs for 120mm ² .	Nos.	50			
2.3.3	Installation of Earth Pit with Cover.	Nos.	2			
2.3.4	Installation of Earth Rod Driving Stud	Nos.	2			
2.3.5	Installation of Saddle Clamp	Nos.	10			
2.3.6	Installation of 25mm dia 3.6m length Copper Clad Steel Earth Rod.	Nos.	2			

**Lightening Arrestors shall be hinged
on near by Light Pole**



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT
ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
E&I WORKS



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PREP. : STR
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
2.4	Misc.					
2.4.1	Bottom Supporting bracket for Arrester Supported Rod Installation.	Nos.	4			
2.4.2	Top Supporting bracket for Arrester Supported Rod Installation.	Nos.	4			
2.4.3	Non Ferrous Pipe 100 mm dia	m	50			
2.4.4	M10 x 40mm Long Brass Bolt c/w Nut & Washer	Nos.	100			
3.0	ESD PUSH BUTTON					
3.1	ESD Push button: INSTALLATION, TESTING & CHECKING of ESD Push button, Single Pole with Single Normally Closed contacts. The Button shall be red In colour with twist to release. ESD Button shall be standard 40 mm Dia Complete with holder and contact blocks. ESD button shall fulfill IEC 60947-5-5. Incoming Shall be for 2 Core 2.5 mm ² Cable that shall be installed, testing, checking, loop checking, commissioning in parallel with Compressor ESD Push button at Compressor control panel to Maru-1 wellhead main gate. (Rate including trench 400mm depth/ as per requirement)) Cable laying, Installation, testing, checking, loop checking, termination, backfilling for cable from ESD Push button near Plant gate and Compressor Control panel 2C x 2.5mm ² CU/PE/PVC/SWA/PVC	Job	1			
3.2	INSTALLATION OF MATERIAL FOR SUPPORTS STAND	No.	1			
3.2.1	ESD Button Stand	No.	1			
3.2.2	100mm x 50mm CHANNEL 6mm THK x 1650 LONG	No.	1			
3.2.3	100mm THK PLATE 150mm x 200mm LONG	No.	1			
3.2.4	1.5" PVC Conduit 3 m Long	No.	15			
3.2.5	Bolted "U"clamps for Conduit.	No.	2			
3.2.6	Cable Gland (M20)	No.	2			
4.0	PRESSURE SAFETY VALVE					
4.1	Installation, testing, commissioning, checking of Pressure safety valve at compressor including removal of existing pressure safety valve keeping in view the safety parameters for replacement of PSV complete in all aspects	Job	1			

TOTAL COST (AMOUNT IN PKR) (A.3)

Notes:

1. The quantity of works in this document is estimated, The cost of all Electrical and Instrumentation works shall be paid to the PC Contractor as per actual work done on site.



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT
ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
E&I WORKS



DOC. NO. : 0504196-INS-BOQ-002
PREP. : STR
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
	<p>2. The Payment of Services by the PC Contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.</p> <p>3. The Estimation of the Actual work done on site shall be carried out and approved by OGDCL/Consultant's Representative present on site.</p> <p>4. The PC Contractor shall be responsible for considering/building all costs required for the completion of works in accordance with the specifications/datasheets/drawings/documents provided in the Tender document. Any increase in cost due to Failure of the PC Contractor to consider/identify/build all costs pertaining to the completion of the Works outlined above shall be at the PC Contractor's own expense.</p> <p>5. Any works if Sub-Contracted by the PC Contractor shall not relieve the PC contractor of his duty to perform the works with due diligence. PC Contractor shall be responsible for the costs incurred due to the irresponsible/un-professional works of the Sub-Contractor.</p> <p>6. OGDCL shall not be liable for any increase in unit rates/cost for the entire duration of the project regardless of any reason whatsoever.</p>					

SUPPLY BOQs



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT



DOC. NO. : 0504196-BOQM-101
 PREP. : MASHOOD
 REV. : 0
 DATE : 01-02-2021

MECHANICAL BILL OF QUANTITIES
FOR
PROCUREMENT OF BULK MATERIAL

SR #	ITEM DESCRIPTION	UNIT	SPEC	TOTAL Qty.	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
1.0	PIPE:						
1.1	Pipe, Seamless, Single Random Length, ASTM A-106 Gr. B / API 5L Gr. B, as per ASME B 36.10						
i	Dia. 8" Sch. 40 (B.E)	m	B1/A1	220			
ii	Dia. 6" Sch. 40 (B.E)	m	B1/A1	50			
iii	Dia. 4" Sch. 40 (B.E)	m	A1	50			
iv	Dia. 2" Sch. 80 (B.E)	m	A1	90			
v	Dia. 1 1/2" Sch. 80 (P.E)	m	A1	1			
vi	Dia. 3/4" Sch. XS (P.E)	m	B1	5			
vii	Dia. 3/4" Sch. 80 (P.E)	m	A1	95			
2.0	ELBOWS:						
2.1	Elbow 90° , Long Radius, B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8" Sch. 40	Nos.	B1/A1	26			
ii	Dia. 6" Sch. 40	Nos.	B1/A1	11			
iii	Dia. 4" Sch. 40	Nos.	A1	5			
iv	Dia. 2" Sch. 80	Nos.	A1	8			
2.2	Elbow 45° , Long Radius, B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8" Sch. 40	Nos.	B1/A1	5			
ii	Dia. 6" Sch. 40	Nos.	B1	1			
2.3	Elbow 90° . S.W, 3000# ASTM A-105 as per ASME B16.11						
i	Dia. 3/4"	Nos.	A1	6			
3.0	EQUAL TEE:						
3.1	Equal Tee. B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8" Sch. 40	No.	B1/A1	5			
ii	Dia. 6" Sch. 40	Nos.	B1	2			
iii	Dia. 2" Sch. 80	Nos.	A1	4			
3.2	Reducing Tee. B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8"x6" Sch. 40	No.	B1/A1	2			
ii	Dia. 8"x4" Sch. 40	No.	A1	1			
4.0	REDUCER :						
4.1	Conc. Reducer, B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8"x6" Sch.40	No.	B1	1			
ii	Dia. 8"x4" Sch.40	No.	B1	2			
iii	Dia. 6"x4" Sch.40	No.	B1/A1	3			
iv	Dia. 4"x3" Sch.40	No.	A1	1			
iv	Dia. 2"x1-1/2" Sch.80	No.	A1	1			
v	Dia. 4"x2" Sch.40x80	No.	B1/A1	2			



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT



DOC. NO. : 0504196-BOQM-101
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 DATE : 01-02-2021

MECHANICAL BILL OF QUANTITIES
FOR
PROCUREMENT OF BULK MATERIAL

SR #	ITEM DESCRIPTION	UNIT	SPEC	TOTAL Qty.	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
5.0	SOCKOLET:						
5.1	Sockolet S.W. 3000# as per ASME B 16.11 Material: ASTM A-105						
i	Dia. 8" x 3/4"	Nos.	B1	5			
ii	Dia. 6" x 3/4"	No.	B1	4			
6.0	WELDOLET:						
6.1	Weldolet, B.W, ASTM A-234 Gr. WPB as per ASME B16.9						
i	Dia. 8" x 2" Sch.40x80	No.	A1	2			
7.0	HEXA HEAD PLUG:						
7.1	HEXA HEAD PLUG NPT. 3000# as per ASME B 16.11 Material: ASTM A-105						
i	Dia. 3/4"	Nos.	B1	7			
8.0	BALL VALVE:						
8.1	Ball Valve RF, 300#, Bolted Body, Replaceable Ball & Seats, Reduced Port, floating ball, Standard Handwheel Operated, As per ASME B-16.5 Body Carbon Steel: Forged ASTM A-105 Normalized, Seal PTFE. As per ASME B 16.34 (VB-104)						
i	Dia. 8"	Nos.	B1	6			
ii	Dia. 6"	Nos.	B1	6			
8.2	SW-NPT Ball Valve 800#, Bolted Body, Replaceable Ball & Seats, Full Port, floating ball, Standard Wrench Operated, ASME B-16.5 Body Carbon Steel: Forged ASTM A-105 Normalized, Seal PTFE, As per ASME B 16.34 (VB-105)						
i	Dia. 3/4"	Nos.	B1	7			
8.3	Ball Valve RF, 150#, Bolted Body, Replaceable Ball & Seats, Reduced Port, floating ball, Standard Wrench Operated, As per ASME B-16.5 Body Carbon Steel: Forged ASTM A-105 Normalized, Seal PTFE, . As per ASME B 16.34 (VB-101)						
i	Dia. 2"	Nos.	A1	1			
9.0	CHECK VALVE :						
9.1	Wafer Type Check Valve, RF, Flanged end, 150#, Body: Carbon Steel: Cast A-216 GR. WCB, Trim: Metal To Metal Seat Dual Plate, as per ASME B16.34 (VC-101)						
i	Dia. 2"	No.	A1	2			
9.2	Wafer Type Check Valve, RF, Flanged end, 600#, Body: Carbon Steel: Cast A-216 GR. WCB, Trim: Metal To Metal Seat Dual Plate, as per ASME B16.34 (VC-102)						
i	Dia. 6"	No.	B1	2			



OIL & GAS DEVELOPMENT COMPANY LIMITED
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MECHANICAL BILL OF QUANTITIES
FOR
PROCUREMENT OF BULK MATERIAL

SR #	ITEM DESCRIPTION	UNIT	SPEC	TOTAL Qty.	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
10.0	FLANGES:						
10.1	Flange, WN, 150#, R.F, as per ASME B 16.5, Material: ASTM A-105						
i	Dia. 8" Sch. 40	Nos.	A1	18			
ii	Dia. 4" Sch. 40	Nos.	A1	5			
iii	Dia. 3" Sch. 40	Nos.	A1	1			
iv	Dia. 2" Sch. 80	Nos.	A1	8			
10.2	Flange, WN, 300#, R.F, as per ASME B 16.5, Material: ASTM A-105						
i	Dia. 8" Sch. 40	Nos.	B1	12			
ii	Dia. 6" Sch. 40	Nos.	B1	14			
ii	Dia. 2" Sch. 40	Nos.	B1	1			
10.3	Flange, WN, 600#, RF, as per ASME B 16.5, Material: ASTM A-105						
i	Dia. 2" Sch. 80	No.	-	2			
10.4	Flange, WN, 600#, RTJ, as per ASME B 16.5, Material: ASTM A-105						
i	Dia. 8" Sch. 40	Nos.	-	5			
ii	Dia. 4" Sch. 40	No.	-	2			
10.5	Blind Flange 300 #, RF, per ASME B 16.5, Material: ASTM A-105						
i	Dia. 8"	Nos.	B1	1			
10.6	Flange, SW, 150 #, R.F, per ASME B 16.5, Material: ASTM A-105						
i	Dia. 1-1/2"	Nos.	A1	1			
10.7	Blind Flange 150 #, RF, per ASME B 16.5, Material: ASTM A-105						
i	Dia. 8"	Nos.	A1	2			
ii	Dia. 2"	Nos.	A1	1			
11.0	GASKETS:						
11.1	3mm Thick Compressed Graphite Filled, Spiral Wound 304 S.S. Central Ring Per ASME B 16.20						
i	Dia. 8" 150#	Nos.	-	13			
ii	Dia. 8" 300#	Nos.	-	13			
iii	Dia. 6" 300#	Nos.	-	18			
iv	Dia. 4" 150#	Nos.	-	3			
v	Dia. 3" 150#	Nos.	-	1			
vi	Dia. 2" 300#	Nos.	-	1			
vii	Dia. 2" 150#	Nos.	-	9			
viii	Dia. 2" 600#	Nos.	-	2			
ix	Dia. 1-1/2" 150#	Nos.	-	1			



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU-RETI COMPRESSION PROJECT
MECHANICAL BILL OF QUANTITIES
FOR
PROCUREMENT OF BULK MATERIAL



DOC. NO. : 0504196-BOQM-101
PREP. : MASHOOD
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	SPEC	TOTAL Qty.	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
11.2	Octagonal Ring , 316 L.S.S						
i	Dia. 8" 600#, R-49	Nos.	-	5			
ii	Dia. 4" 600#, R-37	Nos.	-	2			
12.0	STUDS/NUTS:						
12.1	Studs with 2 Nuts, as per ASME B 16.5 Stud Material : A 193 Gr. B7 Cadmium Plated and Nuts Material : A 194 Gr. 2H Cadmium Plated						
i	1 1/8" x 195 mm Long	Nos.	-	60			
ii	3/4" x 245 mm Long	Nos.	-	24			
iii	5/8" x 155 mm Long	Nos.	-	16			
iv	5/8" x 110 mm Long	Nos.	-	16			
v	7/8" x 140 mm Long	Nos.	-	156			
vi	7/8" x 145 mm Long	Nos.	-	16			
vii	3/4" x 110 mm Long	Nos.	-	104			
viii	3/4" x 120 mm Long	Nos.	-	164			
ix	5/8" x 90 mm Long	Nos.	-	44			
x	5/8" x 85 mm Long	Nos.	-	20			
xi	1/2" x 70 mm Long	Nos.	-	4			

TOTAL COST (AMOUNT IN PKR) (B.1)

Notes:

1. The PC Contractor shall procure (supply) all the material in accordance with the Approved Vendor list and with complete compliance to the attached specifications and datasheets attached in Volume-I and Volume-II of the Tender Document herein.
2. The PC Contractor shall be responsible for all wastages/replacements due to defected/malfunctioned material which shall be at the cost of the PC Contractor.
3. The leftover material shall be the property of OGDCL and shall be reconciled as per clause 15.1 of the Scope of work (Doc. # 0504196-SOW-001) by OGDCL.
4. The PC contractor shall warrant its compliance to Clause 34.0 of the Conditions of contract as documented in Section-V, Volume-I of the Tender Document herein.
5. The PC Contractor shall consider all costs involved in the procurement (supply) of the material including costs for shipping/taxes/withholding/logistic etc. OGDCL shall not be liable for any increase in unit rate/ cost for the entire duration of the project regardless of any reason whatsoever.
6. The PC Contractor shall be responsible for supply/transport of material at Maru-Reti Project site.
7. The Payment of Supply by the PC contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT

ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
SUPPLY OF BULK MATERIAL ITEMS



DOC. NO. : 0504196-INS-BOQ-001
 PREP. : STR
 REV. : 0
 DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
1.0	EARTHING CABLES					
1.1	Supply of 70 mm ² bare stranded Copper conductor.	Meter	180			
1.1.1	Supply of 35 mm ² bare stranded Copper conductor.	Meter	60			
1.1.2	Supply of 06 way Copper Earth Bar	Nos	6			
1.2	Earthing/Grounding System					
1.2.1	Supply of Cable Crimp Connector ('C' Type) - 35mm ² - 70mm ² .	Nos.	50			
1.2.2	Supply of Tin Copper Earthing Lugs for 35mm ² - 70mm ² .	Nos.	50			
1.2.3	Supply of Earth Pit with Cover.	Nos.	6			
1.2.4	Supply of Earth Rod Driving Stud	Nos.	6			
1.2.5	Supply of Saddle Clamp	Nos.	10			
1.2.6	Supply of 25mm dia 3.6m length Copper Clad Steel Earth Rod.	Nos.	6			
2.0	LIGHTENING PROTECTION SYSTEM					
2.1.1	Supply of Pure Copper lightning Arresters (minimum of 1.5 meter length) for lightning protection of Warehouse shed.	Nos.	2			
2.1.2	Supply of 2m per Arrester metal rod for arrester height extension as shown in detail drawing.	Nos.	2			
2.2	Copper Conductors					
2.2.1	1C x 120 mm ² PVC Covered Earthing Cable Green/Yellow	Mtr	100			
2.3	Lightning Grounding System					
2.3.1	Supply of Cable Crimp Connector ('C' Type) - 120mm ² - 120mm ² .	Nos.	10			
2.3.2	Supply of Tin Copper Earthing Lugs for 120mm ² .	Nos.	10			
2.3.3	Supply of Earth Pit with Cover.	Nos.	2			
2.3.4	Supply of Earth Rod Driving Stud	Nos.	2			
2.3.5	Supply of Saddle Clamp	Nos.	10			
2.3.6	Supply of 25mm dia 3.6m length Copper Clad Steel Earth Rod.	Nos.	2			

Lightening Arrestors shall be hinged on near by Light Pole



OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT
ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
SUPPLY OF BULK MATERIAL ITEMS



DOC. NO. : 0504196-INS-BOQ-001
PREP. : STR
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
2.4	Misc					
2.4.1	Bottom Supporting bracket for Arrester Supported Rod Installation.	Nos.	4			
2.4.2	Top Supporting bracket for Arrester Supported Rod Installation.	Nos.	4			
2.4.3	Non Ferrous Pipe 100 mm dia	Mtr.	50			
3.0	ESD PUSH BUTTON					
3.1	ESD Push button: Supply of ESD Push button, Single Pole with Single Normally Closed contacts. The Button shall be red In colour with twist to release. ESD Button shall be standard 40 mm Dia Complete with holder and contact blocks. ESD button shall fulfill IEC 60947-5-5. ESD Enclosure: ESD switch shall be supplied with suitable Explosion proof enclosure for Zone 2, Gas Group IIA and Class T3. Incoming Shall be for 2 Core 2.5 mm ² Cable that shall be supply to install in parallel with Compressor ESD Push button at Compressor control panel to Maru-1 wellhead main gate.	No.	1			
3.2	Supply of 2C x 2.5mm ² CU/PE/PVC/SWA/PVC for Direct burrial.	Mtr.	150			
	SUPPLY OF MATERIAL FOR SUPPORTS STAND					
3.3	ESD Button Stand	No.	1			
3.4	100mm x 50mm CHANNEL 6mm THK x 1650 LONG	No.	1			
3.5	100mm THK PLATE 150mm x 200mm LONG	No.	1			
3.6	1.5" PVC Conduit 3 m Long	No.	15			
3.7	Bolted "U"clamps for Conduit.	No.	2			
3.8	Cable Gland (M20)	No.	2			
4.0	PRESSURE SAFETY VALVE					
4.1	Supply of Pressure safety valve for Separator as per respective datasheet complete in all aspects.	No.	1			
TOTAL COST (AMOUNT IN PKR)				(B.2)		
Notes:						
1. The PC Contractor shall procure (supply) all the material in accordance with the Approved Vendor list and with complete compliance to the attached specifications and datasheets attached in Volume-I and Volume-II of the Tender Document herein.						
2. The PC Contractor shall be responsible for all wastages/replacements due to defected/malfunctioned material which shall be at the cost of the PC Contractor.						
3. The leftover material shall be the property of OGDCL and shall be reconciled as per clause 15.1 of the Scope of work (Doc. # 0504196-SOW-001) by OGDCL.						
4. The PC contractor shall warrant its compliance to Clause 34.0 of the Conditions of contract as documented in Section-V, Volume-I of the Tender Document herein.						



**OIL & GAS DEVELOPMENT COMPANY LIMITED
MARU RETI COMPRESSION PROJECT**

**ELECTRICAL & INSTRUMENT BILL OF QUANTITIES
FOR
SUPPLY OF BULK MATERIAL ITEMS**



DOC. NO. : 0504196-INS-BOQ-001
PREP. : STR
REV. : 0
DATE : 01-02-2021

SR #	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATES (Pak. Rs)	TOTAL (Pak. Rs.)	REMARKS
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- The PC Contractor shall consider all costs involved in the procurement (supply) of the material including costs for shipping/taxes/withholding/logistic etc. OGDCL shall not be liable for any increase in unit rate/ cost for the entire duration of the project regardless of any reason whatsoever.
- The PC Contractor shall be responsible for supply/transport of material at Maru-Reti Project site.
- The Payment of Supply by the PC contractor shall be made as per the Payment Terms agreed in Clause 24.0 of the Conditions of Contract as documented in Section-V, Volume-I of the Tender Document herein.



APPROVED VENDOR LIST



OIL AND GAS DEVELOPMENT COMPANY LIMITED MARU-RETI COMPRESSION PROJECT



APPROVED VENDOR LIST

SAFETY RELIEF VALVES

S No.	Vendor Name	Vendor Logo	Vendor office Address	Website Address
1	Consolidated		510 Industrial Avenue Teterboro, New Jersey 07608 USA	Dresser Consolidated (dresser-consolidated.co.uk)
2	Lesser		Jebel Ali Free Zone JAFZA Office LB-03108, PO Box No. 263762 Dubai UAE	Products - Safety valves LESER
3	Metso		Metso Outotec Corporation, PO Box 1220, FI-00101, Helsinki, Finland.	Metso global website - Metso
4	ARCO		3317 Gilmore Industrial Blvd, Louisville, KY 40213, USA	Anderson Greenwood AGCO - Instrument Valves (arcoengineering.com)
5	Bailey Birkett		Johnson Valves, Unit 7, Trinity Court, Calmore Industrial Estate, Brunel Road, Totton, Southampton, Hampshire, UK, SO40 3WX	http://www.johnsonvalves.co.uk/safety-relief-valves/bailey-birkett-safety-relief-valves/
6	Farris		Beijing, China Tel: +86.106.5058966	Farris Engineering About Us Curtiss Wright Curtiss-Wright Valve Group (cw-valvegroup.com)
7	Emerson Crosby		Emerson US and world headquarters Emerson Electric Co. 8000 West Florissant Avenue, P.O. Box 4100, St. Louis, MO 63133, USA	Products - Pressure Safety Relief Valves (emerson.com)
8	Bopp and Reuther		Bopp & Reuther Messtechnik GmbH Am Neuen Rheinhafen 4 67346 Speyer	www.bopp-reuther.de/en/

ESD Push Button

S No.	Vendor Name	Vendor Logo	Vendor office Address	Website Address
1	ABB		Address: Affolternstrasse 44 8050 Zurich Switzerland Phone: +41 43 317 7111	Emergency stops and pilot devices - Safety Products ABB
2	CEAG		Shanghai Shangyong Safety Technology Co. Limited 2-9, 2F, Building 4 1018 Hangnan Highway Pudong Shanghai 201316, China Telephone: +86 21 51028148	GHG4118201R1307 CEAG Push Button Control Station, IP67 RS Components (rs-online.com)
3	Entrelec		SOLIMM ENGINEERING CO, C 577 17 rue de l'Arche KARACHI 75950 Tél. [92] (21) 634 24 54	"Entrelec Sales by Gross Automation - Your Source to Buy and Service Entrelec Terminal Blocks"
4	Stahl		R. STAHL SCHALTGERÄTE GMBH, WEIMAR, GERMANY	R. STAHL 8453 series control devices (r-stahl.com)

INSTRUMENT AND CONTROL CABLES



S No.	Vendor Name	Vendor Logo	Vendor office Address	Website Address
1	Leoni Kerpen		Marienstraße 7, 90402 Nürnberg, Germany	https://www.leoni.com/
2	BICC		BICC Components Private Limited, 28A, Langley Road, Watford, WD174PT, Herts, England	http://www.biccomponents.com/
3	Belden		Belden - Indianapolis 401 Pennsylvania Parkway, #200 Indianapolis, IN 46280 USA	https://www.belden.com/
4	Fuji Kura		1-5-1, Kiba, Kouto-ku, Tokyo 135-8512, Japan	http://www.fujikura.com/
5	Anixter		5A Toh Guan Road East #06-02 Singapore 608830	Anixter – Wire and Cable, Networking, Security and Utility Power Solutions
6	Pirelli Cables Ltd		Viale Piero e Alberto Pirelli n. 25 (reception in Via Bicocca degli Arcimboldi, 3) 20126 Milan, Italy	https://www.pirelli.com/global/en-ww/homepage
7	Prysmian Cables		Via Chiese 6 20126 - Milan Italy	https://www.prysmiangroup.com/











OIL AND GAS DEVELOPMENT COMPANY LIMITED MARU-RETI COMPRESSION PROJECT




APPROVED VENDOR LIST

8	Eupen		Malmedyer Strasse 94700 Eupen (Belgium) Phone: +32/87/597-000 E-Mail: info@eupen.com	https://www.eupen.com/cable/instrumentation/index.html
9	North Sea Cable		Moseidveien, 4033 Stavanger, Norway	https://cables.no/en/

CABLE GLANDS

S No.	Vendor Name	Vendor Logo	Vendor office Address	Website Address
1	CCG		37 Forge Rd, Spartan, Kempton Park, 1619, South Africa	http://www.ccgcablegland.co.za/ccgintro.asp
2	ALCO (Wattmaster)		34 Lakewood Boulevard (PO Box 8178) Carrum Downs, Victoria, 3201 AUSTRALIA Phone +61 3 9775 1186 Email: sales@wattmaster.com.au	http://www.wattmaster.com.au/cableglands.asp
3	CLIPSAL		78 Waterloo Rd, Macquarie Park NSW 2113, Australia	https://www.clipsal.com/
4	Weidmuller		Klingenbergstraße 16 D-32758 Detmold Germany	https://www.weidmueller.com/int/home
5	Hawke		246 Oxford St W, Ashton-under-Lyne OL7 0NA, UK	https://www.ehawke.com/enclosures/
6	CMP		CMP Products Ltd 11 Glasshouse Street, St Peters, Newcastle upon Tyne, NE6 1BS (No. 06143400) England	http://www.cmp-products.com/
7	Peppers		Stannope Road, Camberley Surrey, GU15 5BT United Kingdom tel. +44 (0) 1276 64232 sales@peppers.com	http://www.cableglands.com/menu_elastomeric_glands.asp
8	Crouse Hind		1201 Wolf St, Syracuse, NY 13208, USA	http://www.cooperindustries.com/content/public/en/crouse-hinds.html
9	ABB		Transformer manufacturing, 1 Gul Crescent, Singapore	http://new.abb.com/

POWER CABLES

S No.	Vendor Name	Vendor Logo	Vendor office Address	Website Address
1	Olex		15/300 La Trobe Street Melbourne Victoria 3000 Australia	https://www.olex.com.au/eservice/Australia-en_AU/navigate-34/Global expert in cables and cabling systems.html
2	Pirelli Cables Ltd		Viale Piero e Alberto Pirelli n. 25 (reception in Via Bicocca degli Arcimboldi, 3) 20126 Milan, Italy	https://www.pirelli.com/global-en-ww/homepage
3	Prysmian Cables		Via Chiese 6 20126 - Milan Italy	https://www.prysmiangroup.com/
4	MM Electrical		19 - 21 Loyalty Road NORTH ROCKS New South Wales 2151	https://www.mmec.com.au/
5	Pakistan Cables		Pakistan Cables, Arif Habib Center, 1st Floor, 23, MT Khan Road, Karachi, Pakistan.	http://www.pakistancables.com/
6	Cleveland		Riverside Park Road Middlesbrough, England. TS2 1QW	http://www.clevelandcable.com/

CARBON STEEL PIPE, FITTINGS & FLANGES

Sr. #	Vendor / Supplier Name	Country of Origin
1	Trouvay and Cauvin	United Kingdom
2	Phocenne	France/UAE/Asia
3	Sandvik	Sweden
4	Nippon Steel Corp.	Japan
5	Kawasaki	Japan
6	Benteler	Germany
7	Technoforge	Italy
8	Erne	Austria
9	Interfit	France
10	Huffaz Engineering (for seamless pipe up to 10 inch diameter)	Pakistan



OIL AND GAS DEVELOPMENT COMPANY LIMITED MARU-RETI COMPRESSION PROJECT



APPROVED VENDOR LIST

11	JFE	Japan / Singapore
12	Corinth	Greece
13	US Steel	USA
14	NKK	Japan
15	Mannesmann	Germany / USA
16	Crescent Steel	Pakistan
17	Data Steel	Pakistan
18	Sumitomo	Japan
19	Melesi	Italy
20	Metalfar	Italy
21	ULMA	Spain
22	MGI	France
23	Gerab National	UAE/KSA/USA
24	Inter Equipment	UAE/Canada
25	JIANGYIN TIANNING METAL PIPE FITTING CO. LTD.	China
26	SUNGKWANG BENDS - KOREA	Korea
27	T.K. CORPORATION	Korea
28	SAMSUNG STAINLESS COMMERCE & IND. CO.LTD.	Korea
29	APCO PIPE FITTINGS CO., LTD	China

GASKETS

Sr. #	Vendor / Supplier Name	Country of Origin
1	Klinger	Australia/Pakistan
2	James Walker	UK/Pakistan
3	Garlock	USA/Pakistan
4	Flexitallic	USA/Pakistan
5	Smith	Europe/UAE
6	SEVAL SRL (www.seval.it)	ITALY
7	Korea Fuji Pack Company Ltd.	Korea

MANUAL VALVES

Sr. #	Vendor / Supplier Name	Country of Origin
1	Shipham	UK/Singapore.
2	Grove	Italy/Singapore.
3	Velan	Canada/Singapore.
4	Cooper Cameron	USA/Singapore.
5	Dresser	UK/Singapore.
6	Newman's/Newco	USA /Singapore
7	OMB Valves	UK/Singapore.
8	Tyco	USA/Singapore.
9	KF	USA/Singapore.
10	Brookbank Valves (For Bronze Valves)	UK/Singapore.
11	Crane Co (For Bronze Valves)	USA/Singapore.
12	Della Foglia	Italy/Singapore.
13	LVF	Italy/Singapore.
14	Valveitalia	Europe/Singapore.
15	JC Valvulas (for manual valves)	UAE/Spain/Singapore.
16	KVC (for manual valves)	UK/Japan/Singapore.
17	Jiangsu Jiulong Valve Manufacturing Co., Ltd.	China
18	SAMJIN JMC CO. LTD.	Korea

Globe Valves

Sr. #	Vendor / Supplier Name	Country of Origin
1	AES	USA/Singapore.
2	Crane	UK / USA/Singapore.
3	Newco	USA / Italy/Singapore.
4	Walworth	USA/Singapore.
5	Kitz	Japan/Singapore.
6	LVF	Italy/Singapore.
7	Valveitalia	Europe/Singapore.
8	JC Valvulas	UAE/Spain/Singapore.
9	KVC	UK/Japan/Singapore.
10	Velan	Canada/USA/China
11	Ecoline - KSB	Germany
12	SHANDONG CAMERON PETROLEUM EQUIPMENT PTE. LTD. (GROVE)	China
13	KUMKANG VALVE MFG.CO.LTD.	Korea
14	SAMJIN JMC CO. LTD.	Korea
15	Jiangsu Jiulong Valve Manufacturing Co., Ltd.	China



OIL AND GAS DEVELOPMENT COMPANY LIMITED MARU-RETI COMPRESSION PROJECT



APPROVED VENDOR LIST

Gate Valves (API 6D)

Sr. #	Vendor / Supplier Name	Country of Origin
1	Cameron	USA/UK/Singapore.
2	Kvaerner Oiltool	USA/UK/Singapore.
3	Control Flow Inc.	USA/Singapore.
4	Newco	USA/UK/Singapore/China
5	FMC	USA/UK/Singapore
6	LVF	Italy/Singapore.
7	Valveitalia	Europe/Singapore.
8	JC Valvulas	UAE/Spain/Singapore.
9	KVC	UK/Japan/Singapore.
10	KF	USA/China
11	Velan	Canada/USA/China
12	Ecoline -KSB	Germany
13	Jiangsu Jiulong Valve Manufacturing Co., Ltd.	China

Ball Valves

Sr. #	Vendor / Supplier Name	Country of Origin
1	Cameron	USA/Singapore.
2	Control Flow	USA/Singapore.
3	Neles Jamesbury	USA/UK/Singapore.
5	Orbit	USA/UK/Singapore.
6	Valvitalia	Europe/Singapore.
7	LVF	Italy/Singapore.
8	JC Valvulas	UAE/Spain/Singapore.
9	KVC	UK/Japan/Singapore.
10	KF	USA/China
11	Ecoline -KSB	Germany
12	SHANDONG CAMERON PETROLEUM EQUIPMENT PTE. LTD. (GROVE)	China
13	KUMKANG VALVE MFG.CO.LTD.	Korea
14	SAMJIN JMC CO. LTD.	Korea
15	Jiangsu Jiulong Valve Manufacturing Co., Ltd.	China

Check Valves

Sr. #	Vendor / Supplier Name	Country of Origin
1	Anvil	USA/Singapore.
2	Butler	UK/USA/Singapore.
3	Crane	USA/Italy/Singapore/Asia
4	Newco	USA/Singapore/Italy/China
5	Tom Wheatley - Cameron	USA/UK/Singapore.
6	JC Valvulas	UAE/Spain/Singapore.
7	KVC	UK/Japan/Singapore.
8	Goodwin	UK
9	KF	USA/China
10	Velan	USA/Canada/China
11	Ecoline -KSB	Germany
15	Jiangsu Jiulong Valve Manufacturing Co., Ltd.	China

Needle Valves

Sr. #	Vendor / Supplier Name	Country of Origin
1	Anderson Greenwood	USA/Singapore.
2	Kenmac	UK/USA/Singapore.
3	KF	USA/UK/Singapore.
4	Oliver	USA/Singapore.
5	Parker	USA/UK/Singapore.

Notes:

1.	All piping material including line pipes, fittings, flanges, bolting etc. shall bear marking as per their relevant manufacturing codes and shall be traceable to the Material Test Certificates (MTCs), hydrostatic test reports and NDTs etc to be supplied by the manufacturer.
2.	All piping material which will be without embossed manufacturing information /details will not be acceptable. The material shall be identified with batch or heat number. All piping material shall be inspected before shipment at vendor's end and be complete with all necessary documentation.
3.	All piping material shall be supplied with certifications from the manufacturer that the items and their manufacturing techniques meet the requirement of the relevant code and standard.



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - III)

SCOPE OF WORK & SPECIFICATIONS

FOR

HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENT/WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)
(0504196-SOW-001)

CONSULTANTS

August, 2021



Petrochemical Engineering Consultants

C-2, Block No. 17, Gulshan-E-Iqbal, Karachi-75300, Pakistan.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	OGDCL APPROVAL	DATE
A	Issued for Tender	IM	SAR	Adeel	20 th Aug, 2021		

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Appendix-A5.....Specification for Production Welding

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1 INTRODUCTION



Oil & Gas Development Company Limited (OGDCL), (hereinafter referred as COMPANY) owns and operates Maru-Reti Gas Field located in the Ghotki district, Sindh, at a distance of approximately 150 kms from Sukkur.

Total eight wellheads have been drilled in the area including RETI-1A, RETI-2, MARU-1, MARU-2, MARU SOUTH, MARU EAST, KHAMISO and Umair-I.



MARU-RETI GAS FIELD (MARU-1 WELLHEAD)



Keeping in view the declining trend in wellhead flowing pressures, OGDCL intends to install a reciprocating compressor package and separator packages suitable to operate in remote locality of MARU-1 wellhead/Maru-Reti Gas Field.

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2 GENERAL

2.1 DEFINITIONS:

COMPANY / OWNER	OIL & GAS DEVELOPMENT COMPANY LTD. (OGDCL)
CONSULTANT:	PETROCHEMICAL ENGINEERING CONSULTANTS (PEC)
CONTRACTOR:	“CONTRACTOR” means the person or persons, firm or Proprietor, PC CONTRACTOR whose proposal, has been/ shall be accepted by the COMPANY for construction, installation / erection, testing and completion of all works and provides Pre-commissioning and commissioning services and support, performance testing and includes the CONTRACTOR's representative(s), legal successors and permitted assignees.
VENDOR/SUPPLIER:	The organization, firm or agency order for the supply of equipment and or material has been placed.
WORKS:	CONTRACTOR is required to execute, procure and supply, provision of services, transportation, fabrication and construction, pre-commissioning, hook-up, commissioning and START-UP services in relation to Process, civil, mechanical and Electrical & Instrumentation as described in the contents of this Scope of Work.
DOCUMENT:	Any form, letter, facsimile, contract, subcontract, specification, requisition, drawing, or record of any kind transmitting information from one party to another. It also includes the underlying data used to produce documents, software, computer generated drawings, calculations, designs, lists, charts, etc., and other data used to form a permanent record of the execution and completion of the WORKS

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2.2 ERRORS OR OMISSIONS:

The review and comments by Company / Company representative shall only indicate acceptance of general requirements and shall not relieve the CONTRACTOR / VENDOR / SUPPLIER etc. of its obligations to comply with the requirements of this document and other referred documents.

Any errors or omissions noted by the CONTRACTOR in this document shall be immediately brought to the attention of the COMPANY.

2.3 DEVIATIONS:



All deviations to this document or other specifications attachments shall be brought to the knowledge of the COMPANY as a section in the bid. All deviations made during the execution of this project shall be with written approval of the COMPANY prior to undertaking any kind of construction, fabrication, installation, erection or execution of works. Such deviation shall be shown in the documents provided by the CONTRACTOR.

2.4 REPORTING PROCEDURE:

A Reporting and documentation system shall be agreed between the COMPANY and the CONTRACTOR, for the status of all the works stated in the document herein. CONTRACTOR shall be responsible to provide daily, weekly and monthly summaries of all major aspects of the works as mentioned in section 7 therein, in the form of reports to the COMPANY.



2.5 DOCUMENTATION:

- All documents to be submitted by the CONTRACTOR to the COMPANY shall be in the English language.
- The S.I. system of units shall be used in documents and drawings, except for the pipe sizes, flanges sizes and bolt/ nuts shall be indicated in inches; unless otherwise specified by the COMPANY.
- The form of fabrication drawings and datasheets shall be as per the international standards. However, CONTRACTOR's format can be used subjected to COMPANY's approval.
- Fabrication drawings and all required documents shall be submitted by the CONTRACTOR to the COMPANY for approval. But such approval of the COMPANY shall in no way relieve the CONTRACTOR of his obligations with respect to such documents.

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3 OBJECTIVE



The objective of this project is successful Installation, Pre-commissioning, Commissioning and Start Up of reciprocating compressor & Separator Packages along with all associated utilities and interconnecting piping between skids as well as, related piping for vent stack, flare and other auxiliaries as specified in the relevant document or implied therein, at Maru-1 wellhead. Complete scope of work is discussed in section 7 & 8 of this document and is also highlighted in *Volume-II* for better understanding.

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4 SUMMARY OF SCOPE OF WORK

COMPANY intends to engage a PC (Procurement & Construction) CONTRACTOR to carry out the required Works on complete responsibility basis with due meticulousness by hiring the services of PC CONTRACTOR for, but not limited to the following summarized services;

- Procurement and supply of all bulk piping, electrical and instrumentation material and related items as required in the BOQs.
- Piping Fabrication, installation/ erection, testing Mechanical Completion, Pre-commissioning & commissioning services, Start-up and hand over.
- Civil Procurement, Supply, Fabrication, Construction installation and erection, finishing, masonry, precast works.
- Installation of Compressor & Separator Packages and associated equipment and Items along with related work to facilitate seamless operation without interruption.
- All type of painting procedures involving but not limited to surface cleaning, paint material storage and preparation, Primer application, Intermediate and finish coat application, Inspection, Painted equipment/material transportation, storage and handling procedure.
- Mechanical completion of complete packages, Pre-Commissioning, Commissioning and Start-up assistance of Compressor Package.
- Procurement, Installation and Completion of all Electrical and Instrumentation Works complete in all aspects.

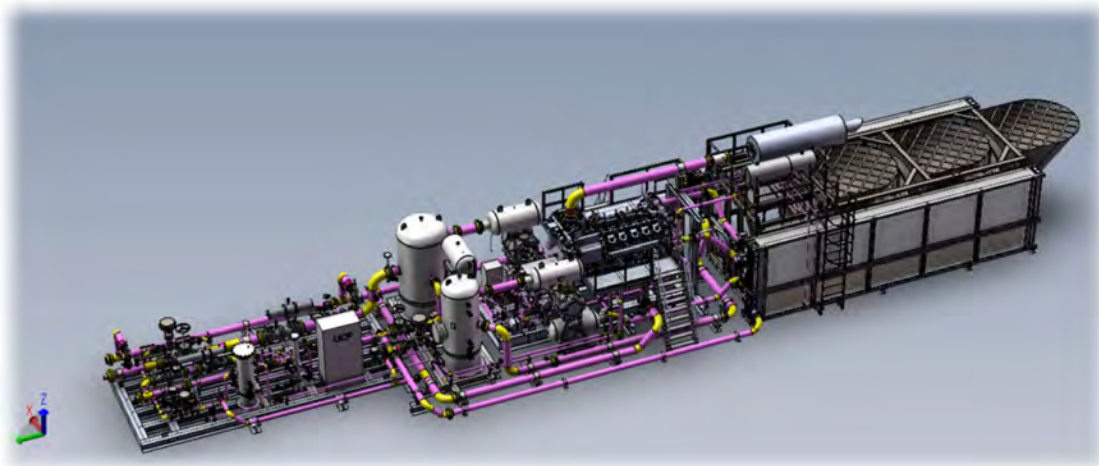
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5 EQUIPMENTS TO BE ADDRESSED UNDER THIS SCOPE



Below list represents the units/components to be installed at Maru-1 Wellhead. It shall be taken into consideration by the CONTRACTOR, that below mentioned, represents a non-exhaustive list of equipment / skids in the CONTRACTOR's scope. CONTRACTOR shall refer to the List of Loose-Shipped Items provided in *Volume-II* of the tender document, along with the relevant documentation including P&IDs, Plot Plan, BOQ, vendor drawings etc. for detailed list and understanding of works required for, but not limited to the construction, installation/erection and pre-commissioning, commissioning and start-up assistance of the New Compressor Package complete with all ancillaries and equipment as well as Separator packages. COMPANY/CONSULTANT shall not be liable for incorrect interpretation/understanding of the required works to ensure seamless operation of the integrated facility.

1. Compressor Package

- Valve Assembly/Pipeline skid
- Suction/Discharge Scrubbers skid
- Compressor skid
- Cooler skid
- Generator Skid



2. Separator packages

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6 CODES, STANDARDS AND SPECIFICATIONS

6.1 GENERAL

The latest edition and published addenda of the following publications in effect on the date of Contract Award are a part of this Scope of work. CONTRACTOR shall identify where applicable, the codes that are being used for designing, fabricating, inspecting, installing, maintaining and testing as specified.

6.2 PRECEDENCE

It is project policy to adopt International and Industry Standards. Wherever necessary, Pakistan standards and regulatory requirements must be incorporated into project specifications.

Should there be any conflict between this document, the requisition, drawings, specifications, codes and standards or lack of clear definition as to the applicability of any specification or standard, this will be identified by CONTRACTOR in writing to the COMPANY immediately for resolution/clarification before proceeding to said WORKS.

In general, the order of precedence for all scope of work shall be:

- Project Specifications
- Drawings
- International/National Codes and Standards
- Referenced Industry Codes and Standards



In the event of a conflict between the referenced standards, the most stringent shall apply. It shall be the CONTRACTOR's responsibility to satisfy the technical and certification requirements of the COMPANY and the local Pakistan authorities.

CONTRACTOR shall be responsible for raising a specification waiver request for COMPANY approval when CONTRACTOR requests to deviate from the enclosed specifications, drawings and other documents of this Contract.

6.3 INTERNATIONAL, NATIONAL AND LOCAL STANDARDS

The codes and standards listed as following are not exhaustive and should be used as a guide to the codes and standards COMPANY would expect CONTRACTOR to use.



The CONTRACTOR shall be responsible for implementation of any regulations concerning the process design, detail design, engineering, procurement, manufacturing and testing of equipment, which are mandatory by Pakistan Law, decree, code or regulations. This shall include compliance with relevant Pakistan governmental, laws

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byelaws and standards. CONTRACTOR shall be responsible for ensuring that the Work also meets Pakistan codes or standards that local permitting may require.

MECHANICAL

AFBMA	Anti-Friction Bearing Manufacturer Association
OSHA	Occupational Safety and Health Administration
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISE	Association of Iron and Steel Engineers
AISI	American Iron & Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigeration and Air conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
ATC / PTC	Acceptance Test Codes / Performance Test Codes
AWS	American Welding Society
HIS	Hydraulic Institute Standard
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NFPA	National Fire Protection Association.
SSPC	Society of Protective Coating

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TEMA Tubular Exchanger Manufacturers Association

UL Underwriters Laboratories

WRC Welding Research Council

UFC Uniform Fire Code

HEI Heat Exchangers Institute

Local Pakistani standards and Regulations (As Applicable)



PIPING

American Petroleum Institute

API600,	Steel Gate Valves - Flanged and Butt-welding ends
API602,	Compact Steel Gate Valves – Flanged, Threaded Welding and extended-body ends.
API594	Check Valves: Wafer and Wafer-lug, and double flanged type
API6D,	Specification for pipe line valves (Gate, Plug, Ball and Check Valves)
API6FA,	Specification for fire tests for Valves.
API598,	Valve Inspection and Testing

American Society of Mechanical Engineers

ASME	Boiler and Pressure Vessel Code, all applicable sections.
ASMEB16.9,	Wrought Steel Butt-welding Fittings.
ASMEB16.11,	Steel Socket Weld Fittings.
ASMEB16.20,	Metallic Gaskets for Pipe Flanges - Ring Joint, Spiral Wound.
ASMEB16.34	Valves - Flanged, Threaded and Weld End.
ASMEB16.5,	Steel Pipe Flanges and Flanged Fittings.

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ASMEB31.3,	Process Piping.
ASME B36.10M,	Welded and Seamless Wrought Steel Pipe
ASME B36.19M,	Stainless Steel Pipe
<i><u>British Standards</u></i>	
BS 1868,	Steel Check valves (Flanged and Butt-welding ends)
BS 1873,	Steel Globe and Globe stop and Check valves (Flanged and Butt-welding ends).
BS 5351	Steel Ball valves
BS 5352,	Steel wedge Gate, Globe and Check valves (50 mm and smaller)
BS 6755,	Testing of valves Part 1: Production pressure testing requirements
BS 6755,	Testing of valves Part 2: Specification for Fire-type testing requirements



National Association of Corrosion Engineers

NACE MR-01-75,	Material Requirement - Sulfide Stress Cracking Resistant Material for Oilfield Equipment.
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CIVIL

American Society for Testing and Materials

ASTMD422	Standard Test method for particle size analysis of soil.
ASTMD1557	Test Method for Laboratory Compaction Characteristics of Soil using modified effort
ASTMD2167	Standard Test Method for density and unit weight of soil in place by the Rubber Balloon method.
ASTMD2487	Classification of soils for Engineering purpose.
ASTMD2922	Standard Test methods for density of soils and soil aggregate in place by Nuclear methods
ASTM D3740	Standard Practice for minimum requirements for

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agencies engaged in the Testing and for Inspection of soil and rock used in Engineering design and construction.

ASTMD4318	Standard Test method for Liquid limit, Plastic limit and Plastic index of soils.
ASTM4253	Standard Test methods for maximum index density and unit weight of soils using vibratory table
ASTM4254	Standard Test methods for minimum index density and unit weight of soils and calculation of relative density
ASTMC33	Standard Specification for Concrete Aggregate
BS	British Standards BS 6031

ELECTRICAL AND INSTRUMENTATION:

IEC



CODE	DESCRIPTION
IEC 44	Instrument transformers
IEC 76	Power transformers
IEC 79-10	Electrical apparatus for explosive gas atmospheres, part 10 : Classification of hazardous areas
IEC 129	Switches and disconnector
IEC 146, 146 A, 146-2	Semiconductors, rectifiers and converters
IEC 228	Conductors of insulated cables
IEC 229	Test on cable over sheath which have a special protective function and are applied by extrusion
IEC 230	Impulse tests on cables and their accessories
IEC 287	Calculation of continuous current rating of cables (100 % load factor)
IEC 298	Self contained medium voltage apparatus
IEC 364-5-54	Electrical installations of building

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Part 5: Selection and erection of electrical equipment

Chapter 54: Earthing arrangement

IEC 420	Combined switch/disconnectors
IEC 439 - 1	LV switchboard
IEC 502	Extruded solid di-electric insulated power cables for rated voltage from 1 kV up to 3 kV
IEC 529	Classification of degrees of protection for enclosures
IEC 540	Test methods for insulation and sheaths of electrical cables and chords
IEEE 587	Guide for surge voltage in low-voltage AC power circuits
IEC 694	Common cause for high voltage switch gear and low voltage
IEC 726	Dry type power transformer.
IEC 811	Common test methods for insulating and sheathing materials of electric cables
IEC 885(2)-1987	Electrical test methods for electric cables part II partial discharge test
IEC 947-2	Circuit breakers
IEC 1330	Distribution substation up to 52 kV (1st Nov 95)
IEC 11171	Dry type power transformer
IEC 60034 (Ed. 4 2000)	Electrical Machinery rotating
IEC 60034-1	Rotating electrical machines Part 1: Rating and performance - Eleventh Edition
IEC 60034-6	Rotating Electrical Machines Part 6: Methods of Cooling (IC Code) - Second Edition
IEC 60034-7	Rotating Electrical Machines - Part 7: Classification of Types of Construction, Mounting Arrangements and Terminal Box Position (IM Code) - Edition 2.1; Edition 2:1992 Consolidated with Amendment 1:2000
IEC 60034-22	Rotating electrical machines Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets - First Edition



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IEC 60044-1	Instrument transformers - Part 1: Current transformers - Edition 1.2; Edition 1:1996 Consolidated With Amendments 1:2000 and 2:2002
IEC 60050 (60605) (1999)	Post electric
IEC 60050-421	International Electrotechnical Vocabulary Chapter 421: Power Transformers and Reactors - First Edition
IEC 60050-446	International Electrotechnical Vocabulary Chapter 446: Electrical Relays
IEC 60051 (1997)	Electrical measuring instruments. Indicators analog direct action and their accessories
IEC 60051-1	Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories - Part 1: Definitions and General Requirements Common to All Parts - Fifth Edition
IEC 60056 (April 2004)	breaker AC high-voltage
IEC 60076 (October 1997)	Power Transformer.
IEC 60079-0 INT 1	Explosive atmospheres Part 0: Equipment General requirements - Edition 5.0
IEC 60079-0	Electrical Apparatus for Explosive Gas Atmospheres part 0 : General requirements
IEC 60079 (Edition 5 2006)	equipment in hazardous areas, general rules
IEC 60079-0	Explosive atmospheres Part 0: Equipment General requirements - Edition 5.0
IEC 60079-1	Explosive atmospheres Part 1: Equipment protection by flameproof enclosures - Edition 6.0
IEC 60079-14	Explosive atmospheres Part 14: Electrical installations design, selection and erection - Edition 4.0
IEC 60079-0 to 18	Electrical Apparatus for Explosive Gas Atmospheres
IEC 60099 (1.1 edition March	Protection against lightning

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2000)

IEC 60157 (1983)	Apparatus low voltage, circuit breaker 'rules'
IEC 60185 (1987)	Current Transformer
IEC 60186 (May 2002)	voltage transformer
IEC 60227-1 (2.1 edition November 1997)	Low-voltage cables, general requirements
IEC 60255 (April 1 edition 2001)	electrical relay
IEC 60258 (June 1989)	Relay measurement and protective device
IEC 60265-1 (January 1998)	switch high-voltage
IEC 60273	Characteristics of Indoor and Outdoor Post Insulators for Systems with Nominal Voltages Greater Than 1000 V - Edition 3
IEC 60282-2 (2.1 edition December 1997)	Fuse high-voltage
IEC 60305	Insulators for Overhead Lines with a Nominal Voltage Above 1 000 V - Ceramic or Glass Insulator Units for A.C. Systems - Characteristics of Insulator Units of the Cap and Pin Type - Edition 4
IEC 60309-1	Plugs, Socket-Outlets and Couplers for Industrial Purposes - Part 1: General Requirements - Edition 4.1; Consolidated Reprint
IEC 60331-3	Tests for electric cables under fire conditions Circuit integrity Part 3: Test method for fire with shock at a temperature of at least 830 Degrees C for cables of rated voltage up to and including 0,6/1,0 kV tested in a metal enclosure - Edition 1.0
IEC 60364 (February 2	Installing low-voltage electric

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edition 2006)

IEC 60364-5-51	Electrical installations of buildings Part 5-51: Selection and erection of electrical equipment Common rules - Edition 5
IEC 60364-5-52	Electrical Installations of Buildings - Part 5-52: Selection and Erection of Electrical Equipment - Wiring Systems - Second Edition; Compiled from and Replaces IEC 60364-5-523(1999)
IEC 60364-5-53	Electrical Installations of Buildings - Part 5-53: Selection and Erection of Electrical Equipment - Isolation, Switching and Control - Edition 3.1; Edition 3: 2001 Consolidated with Amendment 1: 2002
IEC 60364-5-54	Electrical Installations of Buildings - Part 5-54: Selection and Erection of Electrical Equipment - Earthing Arrangements, Protective Conductors and Protective Bonding Conductors - Second Edition; Replaces IEC 60364-5-548
IEC 60364-5-56	Low-voltage electrical installations Part 5-56: Selection and erection of electrical equipment Safety services - Edition 2.0
IEC 60364-7-712	Electrical Installations of Buildings - Part 7-712: Requirements for Special Installations or Locations - Solar Photovoltaic (PV) Power Supply Systems - First Edition
IEC 60364-7-714	Electrical Installations of Buildings - Part 7: Requirements for Special Installations or Locations - Section 714: External Lighting Installations - First Edition
IEC 60383-1	Insulators for Overhead Lines with a Nominal Voltage Above 1 000 V Part 1: Ceramic or Glass Insulator Units for A.C. Systems - Definitions, Test Methods and Acceptance Criteria - Fourth Edition
IEC 60383-2	Insulators for Overhead Lines with a Nominal Voltage Above 1 000 V Part 2: Insulator Strings and Insulator Sets for A.C. Systems - Definitions, Test Methods and



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Acceptance Criteria - First Edition

IEC 60439 (2-June edition 2006)	Collapsing low-voltage switchgear
IEC 60439-2	Low-voltage switchgear and controlgear assemblies - Part 2: Particular requirements for busbar trunking systems (busways) - Edition 3.1 * Consolidated Reprint
IEC 60439-4	Low-Voltage Switchgear and Controlgear Assemblies - Part 4: Particular Requirements for Assemblies for Construction Sites (ACS) - Second Edition
IEC 60439-5	Low-Voltage Switchgear and Controlgear Assemblies - Part 5: Particular Requirements for Assemblies Intended to be Installed Outdoors in Public Places - Cable Distribution Cabinets (CDCs) for Power Distribution in Networks - Edition 2.0
IEC 60529	Degrees of protection provided by Enclosures (IP code)
IEC 60598-1	Luminaires Part 1: General requirements and tests - Edition 7.0
IEC 60598-2-3	Luminaires Part 2-3: Particular requirements Luminaires for road and street lighting - Third Edition
IEC 60598-2-22	Luminaires Part 2-22: Particular requirements Luminaires for emergency lighting - Edition 3.2; Consolidated Reprint
IEC 60662	High-Pressure Sodium Vapour Lamps - Edition 1.10
IEC 60669-1	Switches for household and similar fixed-electrical installations Part 1: General requirements - Edition 3.2; Consolidated Reprint
IEC 60669-2-3	Switches for household and similar fixed electrical installations Part 2-3: Particular requirements Time delay switches (TDS) - Edition 3
IEC 60670-1	Boxes and enclosures for electrical accessories for household and similar fixed electrical installations Part 1: General requirements CORRIGENDUM 1 -
CORR 1	

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	First Edition
IEC 60670-1	Boxes and enclosures for electrical accessories for household and similar fixed electrical installations Part 1: General requirements - First Edition
IEC 60715	Dimensions of Low-Voltage Switchgear and Controlgear Standardized Mounting on Rails for Mechanical Support of Electrical Devices in Switchgear and Controlgear Installations - Edition 1; Amendment 1:1995
IEC 60694 (1996)	Common clauses for high voltage equipment
IEC 60831-1	Shunt Power Capacitors of the Self-Healing Type for A.C. Systems Having a Rated Voltage up to and Including 1 000 V - Part 1: General - Performance, Testing and Rating - Safety Requirements - Guide for Installation and Operation - Edition 2.1; Edition 2: 1996 Consolidated with Amendment 1: 2002
IEC 60832	Insulating Poles (Insulating Sticks) and Universal Tool Attachments (Fittings) for Live Working First Edition - Corrigendum: 05-2000
IEC 60884-2-6	Plugs and Socket-Outlets for Household and Similar Purposes - Part 2-6: Particular Requirements for Switched Socket-Outlets with Interlock for Fixed Installations - First Edition
IEC 60889	Hard-Drawn Aluminium Wire for Overhead Line Conductors - First Edition
IEC 60898-1	Electrical Accessories - Circuit-Breakers for Overcurrent Protection for Household and Similar Installations - Part 1: Circuit-Breakers for A.C. Operation - Edition 1.2; Consolidated with Amendments 1: 2002 and 2 2003
IEC 60934	Circuit-breakers for equipment (CBE) - Edition 3.1; Consolidated Reprint
IEC 60947-2	Low-voltage switchgear and controlgear Part 2: Circuit-breakers - Edition 4.1; Consolidated Reprint
IEC 60947-3	Low-voltage switchgear and controlgear Part 3:

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	Switches, disconnectors, switch-disconnectors and fuse-combination units - Edition 3.0
IEC 60947-4-1	Low-voltage switchgear and controlgear Part 4-1: Contactors and motor-starters Electromechanical contactors and motor-starters - Edition 3.0
IEC 61293	Marking of Electrical Equipment with Ratings Related to Electrical Supply - Safety Requirements - First Edition
IEC 61386-1	Conduit systems for cable management Part 1: General requirements - Edition 2.0
IEC 61386-21	Conduit Systems for Cable Management - Part 21: Particular Requirements - Rigid Conduit Systems - First Edition
IEC 61466-2	Composite String Insulator Units for Overhead Lines with a Nominal Voltage Greater Than 1 000 V - Part 2: Dimensional and Electrical Characteristics - Edition 1.1; Edition 1:1998 Consolidated with Amendment 1:2002
IEC 61537	Cable management Cable tray systems and cable ladder systems - Edition 2.0
IEC 61554	Panel Mounted Equipment - Electrical Measuring Instruments - Dimensions for Panel Mounting - First Edition
IEC 61558-1	Safety of power transformers, power supplies, reactors and similar products Part 1: General requirements and tests - Edition 2.1; Consolidated Reprint
IEC 61936-1	Power installations exceeding 1 kV A.C. Part 1: Common rules - First Edition



PAKISTAN STANDARDS

Pakistan Oil & Gas Regulations 1974

Pakistan Electricity Act 1910

Pakistan NEQS Standards

Pakistan Standard 1401:1978 and Amendment No. 1, Nov 1985 (LPG Product Specifications)

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7 SCOPE OF WORK

7.1 GENERAL



The SCOPE OF WORK includes all activities necessary to procure, supply, construct, install/ erect, test, pre-commission, commission and complete all the Civil, Mechanical, Electrical and Instrumentation and Piping works complete in all aspects. Including supplies of all electrical & piping bulk material except for the equipment mentioned in Section-5 of the document here in and provide Pre-Commissioning and Commissioning assistance required by the OEM/COMPANY for the Compressor package included in the project herein.

The SCOPE OF WORKS for the facilities and ancillaries shall be considered as a guide for CONTRACTOR and the requirements referred herein shall be taken **as minimum requirements**. This SCOPE OF WORKS is not intended to limit or restrict the obligations of CONTRACTOR in respect of the execution of the WORKS and no one part of the SCOPE OF WORKS shall limit any other part of the SCOPE OF WORKS or any of the SPECIFICATIONS nor the responsibilities of CONTRACTOR in respect thereof.

This document is intended to cover the project described herein in accordance with good engineering practice accepted in the industry. The SCOPE OF WORKS defined herein shall be read in conjunction with all other technical documents including the requirements stipulated in the associated documents, referred Annexures, volumes, (specifications, BOQs, drawings, datasheets, etc.) applicable codes and standards and governing regulations included in this tender document. The CONTRACTOR shall carryout all activities necessary to fulfill the CONTRACTOR's responsibility and obligation whether mentioned or not but required for the successful Mechanical completion, pre-commissioning, commissioning and startup for sustainable operation of the equipment installed at Maru-Reti Compression Facility.

Costs for all works, direct or indirect, mentioned or otherwise, shall be deemed to be included in the CONTRACTOR's total bid price. The mentioned works in the document shall be considered as non-exhaustive and CONTRACTOR shall be responsible to include/build all such costs in the bid price.

The descriptions in the document herein are not intended to provide an all-inclusive list of activities or detail of each such activity involved in the execution of the works and shall be taken as minimum requirements. Any work or detail, which is not expressly set forth, but which is necessary to complete the project till Mechanical Completion and to the true intent and meaning of the SCOPE OF WORKS, have to be furnished/undertaken by CONTRACTOR.

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Compressor Package shall be delivered by the OEM/COMPANY at site premises and shall be free-issued by the COMPANY to the CONTRACTOR. The CONTRACTOR shall be responsible for but not limited to assembling, installation, erection of the Compressor Package and Separator Packages (including mobilization of the equipment/packages from the holding location to the foundations/skids) along with installation/assembly/erection/fit-up of all loose items shipped with the packages, as detailed in the List of Loose-Shipped Items provided in *Volume-II* of the tender document herein, as per the directives/guidelines of the Original Equipment Manufacturer (OEM). The CONTRACTOR shall also be responsible to provide pre-commissioning, commissioning and start-up assistance in the presence and as per guidance of OEM with all the related works to facilitate seamless operation without interruption.

CONTRACTOR shall assume full responsibility to complete the WORKS in compliance with Project's requirements, applicable design codes, standards, referred specifications and other applicable local regulations.

In case where work activities (in partial or complete) of the contracted works are sub-contracted by the CONTRACTOR, it is the CONTRACTOR's responsibility to ensure that the installation/erection of complete packages and associated WORKS shall comply with COMPANY requirements and such sub-CONTRACTORS are not to be engaged prior to approval by the COMPANY.

The MECHANICAL WORKS as summarized, shall include procurement, supply, installation /erection, testing, construction, pre-commissioning, commissioning of including but not limited to all piping fabrication, & associated works required to complete the Maru-Reti Compression Project. The CIVIL WORKS as summarized, shall include procurement, supply, fabrication, installation / erection, construction, of but not limited to, Drain pits, vent stack/structure, evaporation pits, crossovers, supports and foundations of all equipment and structures including but not limited to all structural, piping support, civil foundations & associated works for the completion of the Maru-Reti Compression Project, as specified in the detailed scope of work in succeeding sections herein and relevant Documents or implied therein.

The CONTRACTOR shall set out the PROJECT EXECUTION PLAN for all supply works of all required CONSTRUCTION EQUIPMENT, set out the construction and fabrication execution plan, provide all required permits and documents, perform all necessary procurement, execute all fabrication and construction, testing, pre-commissioning, commissioning activities of complete civil, electrical, mechanical works required for integration of the COMPRESSOR PACKAGE, Separator packages and ancillaries in accordance with the PROJECT SCHEDULE and in the timeline specified in Sub Section-7.2 herein.

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CONTRACTOR shall be responsible for Fabrication and construction of the COMPRESSION FACILITY including all site preparation, leveling, grading and filling, foundations, material handling, equipment fabrication placement and supports, piping, valves, fittings and flanges, miscellaneous piping, supports, alignment, pits, structural steel, electrical/instrumentation connections and distribution, earthing systems, underground services, terminations, instruments fittings, cable runs, area lighting, fencing, marker posts and signs, concrete surfaces, grading, surface finishing, radiography, welding, NDT inspection, roads/access, cables and other utilities relevant to the project, Complete in all aspects.

CONTRACTOR shall be responsible for furnishing all labor, materials, necessary equipment, consumables and non-consumables services miscellaneous and necessary items required to satisfactorily complete the WORKS for the Project.

The CONTRACTOR shall be responsible for correct storage and preservation as per requirement of all the supplied and procured material in such a way as not to affect the properties/characteristics of the material. The CONTRACTOR shall also be responsible to provide the adequate environment controlled conditions for the storage of all material, equipment, subtle substances (Including lubes, oils etc.) in full compliance with vendor and COMPANY recommended procedures, material safety datasheets (MSDS), manufacturer's guidelines etc. CONTRACTOR shall ensure that all equipment is properly stored and protected from weather impact and damage.

The CONTRACTOR shall be responsible for providing adequate testing arrangement to enable him to perform the work in accordance with approved test & inspection plans, specifications, codes & standards. Testing facilities / arrangements may include but not limited to complete hydro testing arrangement, lab for civil testing, arrangement for mechanical run test of equipment, arrangement for NDT tests, arrangement for radiography of all welds, arrangement for Post Weld Heat Treatment (PWHT) if required & hardness testing, lab for PSV and other instrument calibration and testing etc. Any other facility / arrangement which shall be required to fulfill the contractual obligation in accordance with relevant specifications, applicable codes & standards to be arranged by the CONTRACTOR.

The description of the services is given as a minimum and shall not be considered as exhaustive definition, and does not relieve the CONTRACTOR from his duty to provide competent services consistent with the nature of the Project.

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7.2 PROJECT TIMELINE

The maximum time for the completion of this scope of work from date of establishment of L/C for supply is Five (5) Months, only (20 weeks). This timeline shall be broken into two phases as outlined below.



- i. Four (04) months for the Mechanical completion of all mechanical, civil and electrical works including but not limited to procurement/supply, construction, fabrication, installation/erection, pre-commissioning & hook-up of New Reciprocating compressor & Separator packages as well as complete integration/modification works required for completion of Maru-Reti Compression project, from the date of establishment of L/C for supply.
- ii. One (01) month for commissioning and start-up of the complete civil, electrical & mechanical works and installed equipment.

This time indicates calendar days (including all weekends) and NOT ONLY WORKING DAYS.

The CONTRACTOR shall be required to work round the clock to meet execution deadlines and Project targets for ensuring the timely completion of the Project. Necessary supervision & supporting staff for round the clock work in 2 shifts, to be arranged by the CONTRACTOR and all such costs shall be at the account of the CONTRACTOR.

The CONTRACTOR shall ensure that its workforce remains engaged in; but not limited to erection, fabrication, installation, inspection, testing, pre-commissioning and commissioning activities round the clock and during the course of all calendar days (this includes all weekends, public holidays and the like) to expedite the work required for project completion. CONTRACTOR shall be responsible to plan all activities and manage the progress accordingly, while taking into account the restrictions of Pandemic/Epidemic lockdowns and the like of which may cause delay in the project completion.

CONTRACTOR shall be responsible to plan all activities and manage the progress accordingly, as time delays will not be accepted. The CONTRACTOR shall be held accountable for all the delays.

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7.3 BATTERY LIMITS

Battery limits and interfaces between the WORKS identified in the SCOPE OF WORKS and work being carried out by other parties involved or associated with the PROJECT are identified under Section-7 Scope of Work and *Volume-II* of the document herein. CONTRACTOR shall, as a minimum, perform all activities identified therein as attributable to CONTRACTOR and coordinate execution of the WORKS and shall liaise with THIRD PARTIES in respect of all interface issues as instructed by COMPANY.

Identifying, specifying and resolving all interface matters, such as the type of information needed by CONTRACTOR from the other parties shall be an integral part of the SCOPE OF WORKS. CONTRACTOR shall prepare the planning, scheduling or other work required for progressing the resolution of such interface matters.

COMPANY reserves the right to make changes to the matters as PROJECT developments and as requirements dictate, and CONTRACTOR must accommodate such changes and manage the consequent impact on the WORKS in an expeditious and proactive manner. The CONTRACTOR shall use its best efforts to minimize any adverse impact on the SCHEDULE.

For better understanding of battery limits for the completion of the Maru-Reti Compression Project, please refer to *Volume-II* of the document herein.



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7.4 SITE VERIFICATION OF CONSTRUCTION DOCUMENTS

The Work divisions listed in succeeding sections are not intended to be an exhaustive detailed statement of all operations involved in the performance of the Work. CONTRACTOR shall be responsible for verification of all COMPANY provided documents / drawings prior to undertaking any kind of fabrication, construction, erection or installation work at site. The CONTRACTOR design verification scope shall include, but not limited to, the following:

- Dimensional verification of civil foundation (equipment / skids / piping & cable tray supports etc.) and foundation foot prints (including centerline of foundation / coordinates) with respect to the Mechanical design.
- Verification of top of foundation elevation with respect to Mechanical equipment, Nozzle elevation, nozzle orientation and connecting piping elevations / orientation.
- Verification of Structural works (elevation of equipment / skids / piping & cable tray supports etc.) with respect to the Mechanical / E&I design.
- Verification of all piping isometrics dimension with respect to field location, as required.
- Verification of cable length as per field conditions.
- Verification of mating flanges dimension between instruments flanges and piping flanges.
- Verification of size, type, ratings, C/C distances of process connection (on piping/ vessels, etc. for instrument connection) before final order placement.
- COMPANY will provide the CONTRACTOR IFC Drawings, data sheets and corresponding BOQs. CONTRACTOR shall verify the quantities of IFC BOQs and identify any additional quantities of materials if required. This shall also involve seeking approval / confirmation from COMPANY on quantities to be ordered & installed by CONTRACTOR.

For verification of the provided documents, CONTRACTOR shall, by site visit(s) at its own cost, familiarize himself with existing facilities, field operation and site details, verify the design data presented to him, clarify any inconsistencies and obtain any additional information he may require to complete his work in all respects; and check, correct and supplement any existing drawings required as a basis for his work. Updating of all received data as a result of site visit, information received from COMPANY etc. shall be the responsibility of the CONTRACTOR.



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CONTRACTOR shall be responsible to furnish all documentation mentioned in specifications / data sheets / drawings attached with the tender document. CONTRACTOR shall consider the same as minimum requirement and shall furnish any other document required by COMPANY to establish compliance of CONTRACTOR' supplied equipment / works with the tender requirements.

The cost of all verification & documentation shall be deemed to be included in the prices quoted in the bid price schedules / BOQs of this tender.

For CONTRACTOR supplied materials, ordering quantities shall be made by the CONTRACTOR considering the net material requirement from the drawings and wastages and overages required for execution of said work. For better management of procurement and to avoid any impact on Project Schedule due to verification works, CONTRACTOR shall prioritize the procurement of material as under:

- a. Immediately upon the establishment of L/C for supply, the CONTRACTOR shall arrange procurement of an initial quantity based on IFC MTOs/BOQs such that it has available sufficient work fronts to work on while procurement of balance materials is made as outlined in (b) below. The CONTRACTOR shall ensure that the initial quantity ordered is sufficient to undertake works without any stoppages until the receipt of materials ordered at (b) below. No extension in time shall be granted due to material shortages.
- b. CONTRACTOR shall carry out the verification of documents / drawings, as detailed out above, and shall inform the COMPANY in writing (a detailed report) of any discrepancies / short comings / shortages / excess materials. After completion of verification activity, CONTRACTOR shall proceed with procurement of remaining material however, CONTRACTOR shall be responsible to complete the verification works, such that the Project Timelines are not affected. Any delays shall be on account of the CONTRACTOR.

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7.5 INSTALLATION OF COMPRESSOR AND SEPARATOR PACKAGES AT MARU-1 WELLHEAD

The Installation scope shall include but not limited to off-loading, transportation from holding location to foundation, Installation, erection, assembly, fit-up and Commissioning assistance of Compressor Package as per the instructions and under supervision of OEM. The installation scope shall also include the Installation/erection and assembly, pre-commissioning and commissioning assistance, of all Loose shipped items with the packages as provided in the List of Loose-Shipped Items attached in **Volume-II** of the document herein.



The Compressor package has a total of 5 skids, which are Main Skid, Pipeline Skid, Scrubber Skid, Air Cooler Structure Skid and generator skid. All parts off the skid need to be disassembled and packed separately due to shipping limitations. It shall be the PC CONTRACTOR's Responsibility to transport/assemble/install/erect & provide pre-commissioning/commissioning assistance for the complete compressor package including all loose shipped items/structure/components complete in all aspects and to accommodate seamless operation of the Compressor package, as provided in the List of Loose shipped items/Vendor drawings etc. attached in **Volume-II**, as per the instructions of OEM and to the satisfaction of the COMPANY/CONSULTANT.

The CONTRACTOR shall also be responsible for the transportation assembly/erection/installation, pre-commissioning, commissioning & hook-up of the separator packages as well as complete civil, electrical mechanical works included under the CONTRACTOR's scope as per the instructions and under supervision of COMPANY/ CONSULTANT at project site.

Note: Wherever, installation of VENDOR/COMPANY supplied equipment is included in scope of work, following shall be deemed to be an integral part of the scope of work.

- Receipt of material
- Securing and transporting up to location of installation.
- Placement, assembling, fixing / installation, securing, supporting etc. complete in all respects.

Note: Any balance activities which are not exhaustively mentioned but deemed required for the Mechanical Completion and full functionality of skids / equipment then the same shall be completed by CONTRACTOR and to be considered inclusive in the respective BOQ item.



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7.6 MECHANICAL SCOPE OF WORK:

The CONTRACTOR shall be responsible for, but not limited to procurement, fabrication, construction and hookup of all mechanical works for seamless operation of compressor and separator packages, interconnecting piping in between skids and modifications at the site defined in the relevant drawings provided in the Volume-II of the tender documents. At the time of contract award, the COMPANY shall provide the CONTRACTOR, Drawings and corresponding BOQs specifications and related documents. The CONTRACTOR after review of BOQs and drawings will immediately verify the quantities of BOQs and identify any additional quantities of materials if required. The CONTRACTOR after receiving all documents shall promptly verify the documents / drawings on site as described in section 7.4 of the document herein. This shall be done prior to start of prefabrication activity in a manner so that overall schedule of the project is not disturbed.

COMPANY shall only provide CONTRACTOR the equipment listed under section-5 of the document herein as a free-issue. The CONTRACTOR shall be responsible to completely inspect/witness COMPANY's free-issue packages/equipment, prior to taking custody of them after award of project. CONTRACTOR, upon hand over of equipment/packages etc. shall unpack and check the items/equipment handed over in detail, as well as verify the quantities, equipment name, model, size, packing number, physical material checks (with the packing list and with the engineering design documents), box number, the number of parts and so on as per the relevant document. The unpacking of equipment shall be carried out in the presences of a COMPANY's representative. If any deficiency/deviation is found during the inspection of the received material the CONTRACTOR shall promptly notify the COMPANY within 2 days in a written response in the form of Over, Short & Damaged Report (OSDR) to ensure timely completion of the project herein. The COMPANY shall not entertain any claim or idling or extension of time on account of short supply or damaged supply or erroneous supply of material if the CONTRACTOR fails to timely identify the material discrepancies. Further, COMPANY shall review the CONTRACTOR identified short supply, damaged supply or erroneous supply of material and shall advise suitable action. On COMPANY instruction, if required the CONTRACTOR shall immediately arrange the procurement & supply of such items to ensure the completion of project within stipulated time.

The CONTRACTOR shall be responsible for all the procurement/supply of piping bulk material within the project timeline as mentioned in section 7.2, the CONTRACTOR shall expedite the procurement work in such a manner as not to affect the project timeline. Any delays related to supply/procurement of material shall be on the account of the CONTRACTOR. The procured/supplied material shall be leak tested / inspected for damage during shipping/transportation prior to undertaking any kind of fabrication, construction and installation / erection work at site and its premises. Any defect found

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during inspection shall be replaced by the CONTRACTOR at its own cost with no effect to the COMPANY. For CONTRACTOR's supplied/procured material all cost including but not limited to shipping/taxes/withholding/logistics etc. shall be considered as part of the price quoted in the CONTRACTOR's commercial bid.

Shifting of material/equipment/skids/packages/loose items etc. from COMPANY's storage facility to project site/ warehouse/ temporary storage/facility/structure/skid foundation shall be carried out by the CONTRACTOR and the number of journeys required to shift the material shall not be limited, and shall take place as the work requires them.



The transportation of CONTRACTOR's supplied/procured material consumables, labor etc. shall also be the responsibility of the CONTRACTOR. Any repair / maintenance or earth works / compaction that may be required for the transport of material / equipment are included in CONTRACTOR's scope. No claims for additional works in this regard shall be entertained by the COMPANY.

CONTRACTOR shall be responsible for but not limited to furnishing all labor, materials, necessary equipment, consumables and non-consumables, services, miscellaneous and necessary items required to satisfactorily complete the mechanical works for the Project.

7.6.1 MECHANICAL EQUIPMENT ERECTION

The mechanical equipment installation shall cover erection of all the equipment and packages. CONTRACTOR's Scope of Work for all required mechanical equipment erection shall include, but not limited to the following:

- CONTRACTOR shall be responsible for safe transportation of equipment/packages/skids/loose items from holding location to skids foundation and carry out rigging study for the equipment skids.
- Installation at a definite location, including setting, initial alignment and tightening and tensioning of foundation bolts (only through hydraulic torque machine);
- The CONTRACTOR shall also carry out complete installation/erection/assembly, construction of the loose items within the skid of the COMPANY supplied packages as to accommodate the seamless operation of the equipment/packages.
- Final alignment after connection of plant piping as well as interconnecting piping in between different skids;
- Provision of protection against mechanical damage and damage from weather conditions;

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- Pre-commissioning, Commissioning & start-up assistance of complete compressor package as per the directives/guidelines of the OEM/COMPANY.



7.6.2 PIPING WORK

Piping work included in the CONTRACTOR's scope mainly comprises of installing compressor & separators inter-skid/off-skid piping and the modification/integration works required for the integration of the packages/equipment with the Existing Facility at Maru-1 wellhead.

Note: The term 'piping' for the purpose of this scope of work includes the following, but not limited to:



- Pipes and fittings
- All types of valves and actuators
- PSVs, PRVs, ESDV, BDV (any other item which is not mentioned in the Instrumentation Scope of Work)
- Piping hardware (Nuts, bolts, studs, gaskets, isolation kits etc.)
- Spectacle blanks and blinds
- All types of flanges
- Restriction orifices, rupture discs
- Expansion joints, flexible hoses etc.
- Strainers
- Injection nozzles
- Corrosion Coupons
- Any other items as specifically mentioned in the P&IDs
- All types of pipe supports including hangers supports and any other special supports which shall be required, as a result of detailed engineering & design, and thermal & stress analysis, to meet process and performance requirements of the Plant, and as per specification and relevant codes & standards of plant piping.
- Painting, coating, insulation (hot, cold, personal protection etc.) of complete plant piping in accordance with design and process requirements, and as per applicable codes & standards.

For details, please refer to the construction drawings attached in **Volume-II**.

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7.6.3 GENERAL REQUIREMENTS:

- Equipment shall be handled using manufacturer's recommended lifting points or approved techniques from COMPANY, along with a detail rigging study done by the CONTRACTOR;
- Prior to equipment installation, foundation location, orientation, elevation and anchor bolt locations shall be checked and verified in accordance with approved project drawings;
- Items that may be damaged during equipment installation (sight glasses, gauges, davits, thermo-wells, earthing cables etc.) shall be removed and temporarily stored. All openings, bearing surfaces and threads shall be protected;
- The connected piping shall be arranged and supported in such a manner that no strain is imposed on the equipment both and nozzles during hydro testing and operation;
- The 3rd party test certificates of the lifting equipment cranes, fork-lifters, slings, shackles etc. shall be checked and verified by the safety officer, prior to starting equipment erection;
- Erection of all equipment shall be carried out under the supervision of qualified, experienced construction supervisor and safety officer;
- Some components of the package are to be transported loose by the OEM, the CONTRACTOR shall assemble all these loose components in the presence of COMPANY's representatives and Original Equipment Manufacturer (OEM) Representative as per the drawings / manuals or OEM Representative's instructions. CONTRACTOR shall be responsible to invite the COMPANY/OEM representative to witness such assembling procedures.
- Complete assembling of compressor package air cooler along with Integration of air cooler with compressor shaft is included in the CONTRACTOR's scope of work along with all the necessary work for the packages to function correctly, under the supervision of OEM's representative.
- CONTRACTOR shall provide skilled work force for assistance in the pre-commissioning, commissioning and start-up of the Compression Package under the supervision of OEM's Representative. If the work force competency level is not as per OEM's/COMPANY's satisfaction the CONTRACTOR will immediately replace such work force with the competent one.
- No nozzles or other vital attachments on the equipment being lifted shall be used as supporting or lifting points other than those which have been specifically designed and designated for the purpose.



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- CONTRACTOR shall be responsible for all the works deemed necessary for the uninterrupted operation of the compressor & Separator packages.
- CONTRACTOR shall be responsible for the fabrication, construction, installation, erection, pre-commissioning, commissioning of the modification/integration works needed for Tie-ins as well as for hook-up of separator packages as specified in the relevant construction documents.
- The CONTRACTOR shall also be responsible for the Mechanical completion of complete piping works as provided in the Construction documents attached in *Volume-II* of the document herein.
- CONTRACTOR shall also be responsible for Demolishing works and suitable disposal of any existing constructed foundations (having or not having placed equipment on it) or civil work or removal & shifting of skids / equipment / material to and from site to COMPANY designated location(s), if deemed necessary and advised by the COMPANY.

7.6.4 PIPING FABRICATION AND ERECTION

CONTRACTOR's Scope of Works shall include the following, as a minimum:

- Procure/supply, Fabricate, erect and pressure test all piping work as per Contract Specifications and Drawings provided in *Volume-II* of the document herein.
- Supply of all consumables, non-consumables, temporary materials including all tools and tackles required for the execution of the job.
- Welding procedure and welder's qualification, prior to commencement of production welding.
- Prepare all weld procedures or adopt existing procedures and qualify them in accordance with Contract Specifications and Procedures.
- Prepare heat treatment procedure as per ASME standards and submit to COMPANY for approval.
- Fabrication, installation, testing coating, painting of piping systems under the supervision of an experienced and qualified construction supervisor and QA/QC engineer.
- Take precaution during the installation of pipe works connected to equipment, to avoid excessive forces and moments on nozzles. Supports shall be provided as per the relevant construction drawings for piping connected to equipment to compensate for thermal expansion.

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- Welding of dog-legs, cleats, or other devices to pipe for alignment purposes or for handling is strictly prohibited. Any devices used for fit up of pipe for welding or flanging must be approved by COMPANY;
- Preparation and completion of all painting, coating and insulation procedures as specified in the specification attached along with the document herein, including painting and insulation on existing lines where required.
- Provide necessary equipment, tools and skilled manpower to carryout above mentioned work.
- The CONTRACTOR shall be responsible for control of wastage of material. The CONTRACTOR shall be responsible for preparation of cutting plan and control of cut length of pipe for optimum utilization of Pipe material. CONTRACTOR shall also be responsible for accurate measurement of cable length before cutting of cables. No payments shall be made for coiled length or unjustified wastages; COMPANY shall only pay for the installed quantities in accordance with the drawings.

CONTRACTOR shall provide a Fire Watch and at least one fire extinguisher at every hot work location. The Fire Watch shall be in compliance with COMPANY requirements.

CONTRACTOR shall comply with the Welding specifications as per ASME Section IX, and the welding specifications provided in the attached annexures with the document herein.



Responsibility of the all work until hand over to the COMPANY shall remain with the CONTRACTOR.

All welders shall be qualified to weld in accordance with the approved Welding Procedure Specifications (WPS) and shall be a COMPANY approved welder. Should the welder be not a COMPANY approved welder then he shall undergo welder test, which shall be witnessed by COMPANY. Any cost incurred for the welder test shall be borne by the CONTRACTOR. COMPANY reserves the right to reject any welder that is deemed not suitable or competent for the work, without assigning any reason. The CONTRACTOR shall, at the earliest, replace the individual with a competent one.

It is advised to pre-fabricate pipe assemblies, perform NDT, radiography and hydrostatic test at CONTRACTOR's fabrication yard where applicable and possible.

CONTRACTOR shall provide the manpower, material, equipment and arrangement of Non-Destructive Testing (NDT) and Radiography. All fillet welds shall be Dry Penetrant tested.



All required testing shall be reviewed and verified by COMPANY authorized inspector with two (2) days early notification.

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CONTRACTOR shall carry out the PWHT of all process lines where required. PWHT shall be carried out according to heat treatment procedures which shall meet the requirements of relevant codes and standards i.e. ASME Section VIII and NACE requirement. CONTRACTOR shall submit the PWHT execution procedure for COMPANY/ COMPANY Representative for approval.

7.6.5 PIPING HYDRO-TEST

- All pipe works are to be pressure tested in accordance with the procedures and specifications.
- CONTRACTOR shall prepare and submit the Hydro test and flushing procedure, for COMPANY review and approval. The procedures shall highlight the machinery and equipment parts that must be isolated during the tests. The procedure shall highlight the valve and instruments that must be isolated during the test.
- CONTRACTOR shall adhere to the Hydro test and Flushing Procedure prior to closing up the piping systems. CONTRACTOR shall ensure that no foreign materials are left in the pipes and which could not be flushed out during flushing;
- CONTRACTOR is responsible to supply water for hydro test and leak test purpose. Hydro test water shall be analyzed and detailed report shall be submitted to the COMPANY for approval for chemical composition and suitability of usage.
- It is CONTRACTOR's duty to carry out any weld repairs.
- Every repair shall undergo another hydro static test under the same previous conditions.
- CONTRACTOR shall utilize calibrated instruments for all WORKS. The satisfactory measurement readings shall be followed by the signature of COMPANY's Representative.
- CONTRACTOR shall submit a program for any testing works for COMPANY's approval not later than two (2) weeks prior to commencement of testing.
- During the whole period of testing the Works, CONTRACTOR shall provide and install in accordance with the specifications and drawings, calibrated and accurate tests gauges and recorders and all other necessary materials and equipment required in performing pressure testing.
- All welded joints may be painted with primer only in order to prevent initial corrosion until the completion of non-destructive and pressure testing before full coating is allowed.

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- All instruments or equipment which might be damaged during pressure testing including the control valves and relief valves shall be removed or isolated during the pressure testing.
- After completion of hydrostatic test, a reinstatement test for each system shall be conducted at a test pressure 95% of the lowest rated relief valve setting in the system. When no relief valves are present, the system shall be reinstated at 100% of the system operating pressure. CONTRACTOR shall prepare and submit the reinstatement procedure to COMPANY for review and approval (02) weeks in advance of any reinstatement works.
- Instrument air leak test shall be carried out by CONTRACTOR to all hydraulic signal lines. Leak test shall be done by using a bubble tester. The maximum allowable leakage rate shall not exceed 7 bubbles per minute. This test shall be witnessed and verified by CONTRACTOR quality control inspector and COMPANY Representative.
- Upon completion of hydrostatic pressure testing, CONTRACTOR shall drain and dry to the satisfaction of COMPANY, the piping by suitable method approved by COMPANY.
- CONTRACTOR shall remove all temporary facilities installed by CONTRACTOR once testing is completed to the satisfaction of COMPANY. Tests shall be witnessed by COMPANY and records of all tests shall be furnished to COMPANY within forty-eight (48) hours of the test.
- Completion of final flushing of piping shall be after the reinstatement testing and acceptance by COMPANY.
- All pipe works shall be adequately flushed using a high pressure and high volume flow of fresh and clean water upon completion of installation. Flushing shall be carried out with all valves fully open. CONTRACTOR shall ensure that adequate fresh and clean water be made available to perform the above works. It is CONTRACTOR's responsibility to dispose of all cleaning water.
- CONTRACTOR shall provide all equipment, consumables, labor and services necessary for carrying out the mechanical testing and mechanical completion. This will include but not limited to welding and purging gases or flanges, spool pieces, piping, hoses, manifolds, consumables, etc. that are required for hydro-testing and mechanically completing the pipe-work. All consumables, equipment, tools and vehicles shall be subjected to COMPANY inspection and approval.
- All tests shall be subjected to COMPANY's approval.



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CONTRACTOR shall carryout a leak test at a pressure to be specified by the COMPANY/CONSULTANT. This test shall ensure mechanical integrity of the newly constructed/ revamped fabrication. It shall be CONTRACTOR's responsibility to provide nitrogen for leak testing. The CONTRACTOR shall provide other necessary tools, equipment and manpower necessary for such testing. If leak test fails, the CONTRACTOR shall be responsible for the required rectification/ repairing. After successful completion of the test, nitrogen shall be left in the system, at a pressure slightly higher than the atmosphere until the gas is introduced.

7.6.6 SURFACE PREPARATION AND PROTECTIVE COATING

Requirements for surface preparation and protective coating, CONTRACTOR shall perform surface preparation and protective coating (if required) as per the following:

- CONTRACTOR shall perform surface preparation and painting of structural members, miscellaneous items and all other facilities to complete Works. CONTRACTOR shall ensure that the painting color coding is in accordance with COMPANY's color coding.
- CONTRACTOR shall make available on site, if necessary, the painting/coating manufacturer's representative to provide all supervisions and technical advice during all phases of painting/coating;
- CONTRACTOR shall also provide at the Work Site, approved wet and dry paint thickness measuring devices.
- CONTRACTOR shall comply with the Painting Specifications attached in the attached annexures with the document herein.
- CONTRACTOR shall consider severe corrosive atmosphere and shall be responsible for surface preparation and painting of all equipment and fabricated items in accordance with the approved procedure and codes and standards to the satisfaction of COMPANY. All blasting works for surface preparation shall be by grit blasting using approved grit materials;
- CONTRACTOR shall carry out Works in such a manner and sequence that surface preparation and painting can be carried out efficiently, with minimum disruption to other trades, and with minimum amount of "touch-up" work required;
- All steel structure welded joints may be painted with primer only.
- CONTRACTOR shall perform surface preparation and painting of mechanical and piping, miscellaneous items and all other facilities to complete Works. CONTRACTOR shall ensure that the painting color coding is in accordance with COMPANY's color coding.

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- All piping welded joints may be painted with primer only and CONTRACTOR shall complete the painting of piping after non-destructive and hydrostatic testing have been completed and accepted by COMPANY's representative.

All Surface preparation and coating WORKS as specified in above section shall be as per the specifications provided in the annexures attached with the document herein. The provided specifications shall be taken **as minimum requirements** and is not intended to limit or restrict the obligations of CONTRACTOR in respect of the execution of the WORKS and does not relieve the CONTRACTOR of his responsibilities to carry out work according to the relevant international codes and local rules and regulations or implied therein.

7.6.7 COMMISSIONING

CONTRACTOR shall be responsible for the commissioning assistance of, the Compressor Package with all the necessary testing of but not limited to equipment, piping, instrument, loose items as per the instructions, directives and guidelines of the OEM/COMPANY at Maru-Reti Project Site. The CONTRACTOR shall also be responsible for the Pre-Commissioning, commissioning and hook-up of the separator packages and modification/integration works with the existing Maru-Reti plant, as per the specification/drawings/documents provided in the Tender Document. The CONTRACTOR shall also be responsible for the commissioning of its procured/supplied material.

The CONTRACTOR shall be responsible for the procurement and supply of nitrogen and other testing mediums, equipment and materials required as per the directives of OEM and/or COMPANY.

7.6.8 COMPLETION AND START-UP

7.6.8.1 GENERAL



Mechanical completion for the facilities (as a whole) under this project shall be achieved in two phases i.e. Mechanical Completion and Provisional Acceptance.

CONTRACTOR shall provide all necessary pre-commissioning equipment, tools, instruments, temporary power, compressed air, nitrogen, etc.

7.6.9 MECHANICAL COMPLETION CERTIFICATE

Following steps shall be followed for the issuance of mechanical completion certificate;

- CONTRACTOR shall conduct an in-house inspection of the relevant system(s) and generate a Punch-List.
- Once the CONTRACTOR's punch-list items are closed and pre-commissioning requirements/tests related to each individual system (portion



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of the Works) are completed, CONTRACTOR shall invite/request for COMPANY's inspection and provide CONTRACTOR's closed punch-list, test results, and Mechanical Completion checklist for COMPANY's review and information.

- COMPANY representative shall carryout inspection of the system/equipment and issue a punch list to CONTRACTOR within 5 days of CONTRACTOR's request to COMPANY for inspection. The punch lists will be of two types:
 - Critical (items in the opinion of the COMPANY, without which safe and intended operation of the facility cannot be ensured).
 - Non-Critical (items in the opinion of the COMPANY, without which safe and intended operation of the facility is not compromised in any manner and that the same could be carried out without Plant/facility shut-down).
- CONTRACTOR shall carry out all the necessary activities to clear out the punch list items. The procedure mentioned above shall be repeated until all COMPANY's punch-list items are closed and signed off by COMPANY representatives.
- CONTRACTOR shall apply for the mechanical completion certificate when all the critical & Non Critical punch-list items have been closed out and signed off by COMPANY representatives.
- CONTRACTOR shall provide assistance for Pre-commissioning activities for the Compressor Packages as per the site instructions given by OEM.
- Activities in mechanical running test of Compressor Packages shall be under the supervision of OEM's representatives and as per their instructions.
- All such testing of system components shall be subjected to witnessing by Vendor's Representative and COMPANY/ COMPANY Representative.

The project shall only be accepted by COMPANY/CONSULTANT as mechanically complete and ready to commission after a physical inspection of the installation/fabrication/construction/erection has been carried out to verify that all piping, electrical and instrument systems, etc. of complete compressor & separator packages as well as modification/integration works have been accomplished in accordance with final construction drawings/documents/ specifications attached in the Tender document herein.



CONTRACTOR shall set out the works and shall be responsible for true and perfect levels and setting out of the same and for correctness of the direction, levels, dimensions and alignments of all parts. If at any time error in this respect shall appear during the progress of the works, the CONTRACTOR shall at his own expense rectify error to the satisfaction of the COMPANY/ Engineering Consultant. Any checking by the COMPANY/ Engineering Consultant shall not relieve the CONTRACTOR from his complete unshared responsibility for correct setting out of works. The CONTRACTOR

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shall construct and maintain accurate Bench Marks so that the COMPANY/ Engineering can easily check the lines and levels of the works.

For further details, please refer to the construction Drawings attached in *Volume-II*.

All Mechanical WORKS as specified in preceding section 7.6 shall be as per the specifications provided in annexures attached with the document herein. The provided specifications shall be taken **as minimum requirements** and is not intended to limit or restrict the obligations of CONTRACTOR in respect of the execution of the WORKS and does not relieve the CONTRACTOR of his responsibilities to carry out work according to the relevant international codes and local rules and regulations or implied therein.

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7.7 CIVIL SCOPE OF WORK

7.7.1 EQUIPMENT/SKIDS

During Installation, equipment and skids scope shall also include construction and associated civil works for all foundations of all equipment/skids/loose item of compressor, Separator and generator packages with complete assembly.

CONTRACTOR is responsible to arrange the cranes (main and tailing) and all the necessary machinery required for the installation of all equipment/skid/packages. Rigging studies to be provided by CONTRACTOR to COMPANY for approval. All vehicles should be operated in the presence of a Marshal and safety considerations undertaken and risks identified therein.

7.7.2 STEEL STRUCTURES

The CONTRACTOR shall be responsible for complete procurement, supply, fabrication construction, installation and erection of all steel structures complete in all aspects, including but not limited to vent stack structure, crossovers, pipe supports etc. as included in the battery limits of the Project herein as specified in the relevant documents, attached in *Volume-II* of the document herein.

7.7.3 CIVIL CONSTRUCTION

CONTRACTOR shall be responsible to procure, construct, fabricate, install and erect all but not limited to equipment, structure and piping support foundations as per the design provide by the CONSULTANT/VENDOR.



For further details, please refer to the Construction Drawings attached in *Volume-II*.

7.7.3.1 General

The civil construction scope shall include, but not limited to, all procurement related to temporary and permanent Civil WORKS, Structural Construction and erection, excavation, lean, form working, concreting, bar cutting, bending placing, curing, bitumen coating, backfilling, grouting, painting, finishing works, dewatering, sample testing, inspection and onsite testing of the procured material. The CONTRACTOR is also responsible for supply of qualified man power, materials, tools, tackles, equipment, transport, supervision, quality management, inspection, sampling and testing, consumables, topographical and underground survey works, etc.



The work requirements include, but not limited to the following:

- CONTRACTOR shall be responsible to procure all the material for supply, fabrication, construction, installation/erection and associated Civil WORKS of, but not limiting to, evaporation pit, drain pit, all foundations, all structures, all pipe supports as specified in the relevant documents/drawings attached in

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Volume-II of the document herein, in accordance with the specifications provided in the tender document.

- CONTRACTOR shall carry out all temporary and permanent civil and structural construction necessary for the safe completion of the work.
- CONTRACTOR shall supply all civil/structural materials, sanitary and water supply fittings, tools, equipment, consumables, labor and supervision to carry out the civil and structural activities.
- CONTRACTOR shall establish a site datum bench mark at each work site and use it for setting out the civil works based on Topographical survey information.
- CONTRACTOR shall identify and clearly mark all buried services affected by the work before any construction work takes place near them. CONTRACTOR shall also be responsible to verify the conditions at the site before initiating any underground works
- All materials and works shall be as per contract drawings and project specifications. Written approval from COMPANY shall be obtained for any deviations from the contract drawings and project specifications.
- Costs of bulk materials related to civil/structural and construction works including, but not limited to, cement, reinforcement steel, aggregates, structural steel, water, formwork, materials for protective coatings for steel & concrete works, fire proofing materials, fencing, gates, materials for water supply and sanitary works, sanitary fittings, consumables etc. shall be included in the related construction costs.
- All materials and equipment required for the construction and testing shall be supplied by the CONTRACTOR.
- CONTRACTOR shall perform inspection and testing of procured materials as necessary in accordance with the project specifications.
- All equipment and materials shall be carefully handled and stored at site, either inside covered stores or inside fenced materials yard, depending upon the type of equipment or material. Handling, preservation and storage of equipment and materials shall be carried out in conformance with manufacturer's instructions, in addition to COMPANY requirements. Regular inspection of stored items shall be carried out to verify adequacy of storage protection provided.
- CONTRACTOR shall dispose surplus earth and debris to COMPANY's designated location.



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- All materials used in the work shall be inspected, tested, and approved before incorporation in the work. Any work in which untested materials are used without approval or written permission shall be performed at the CONTRACTOR's risk. Materials found to be unacceptable and unauthorized may be required to be removed at the CONTRACTOR's expense. Unless otherwise designated, tests in accordance with international standards will be made by and shall be at the expense of the CONTRACTOR. Samples shall be taken by CONTRACTOR's qualified and approved personnel. All materials being used are subject to inspection, test, or rejection (if the materials are not as per project requirements) at any time prior to or during incorporation into the work.
- Any material that does not conform to the requirements of the agreement, plans, or specifications shall be considered unacceptable and shall be rejected. CONTRACTOR shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by COMPANY.
- Rejected material, the defects of which have been corrected by CONTRACTOR, shall not be returned to the site of the work until such time as COMPANY has approved its use in the work.
- CONTRACTOR shall be responsible for fixing any damages they may cause at their own expense to the full satisfaction of COMPANY and all the stakeholders therein.

7.7.3.2 General Requirements



CONTRACTOR shall be responsible for furnishing all labor, materials, necessary equipment, consumables and non-consumables services miscellaneous and necessary items required to satisfactorily complete the civil works for the Project. In general requirements for civil construction shall include but not limited to the following:

- Cleaning and preparation of the area; (The cleaning & grubbing shall include but not limited to removal of trees, vegetation, roots (if any) or any other undesired material and disposal to a lead as directed by COMPANY).
- Grading works and slope protection works.
- Protection of the existing facilities at the plot.
- CONTRACTOR may be required to make arrangements for dewatering. The dewatering shall be done as per specifications and prevailing site conditions. The CONTRACTOR shall be responsible for proper disposal of the ground water.
- The Worksite preparation shall include clearance, rough grading, general earth works, leveling to grade, temporary boundary fencing, opening of roads to

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Worksite, excavation and backfill as per drawing. The final site levels shall be approved by COMPANY.



- CONTRACTOR shall be responsible for the construction of Pipe sleepers, pipe road crossing culverts (if any), pipe supports, pipe racks, pipe bridges and associated structural works.
- CONTRACTOR shall be responsible for the construction of Cross-over, platforms, ladders & hand railings.
- CONTRACTOR shall be responsible for the construction of Foundations for steel light poles, flood light mast, wind socks etc.
- CONTRACTOR shall be responsible Excavation and backfilling (with approved material) for foundations and pits.
- Disposal of surplus earth and debris to a location designated by COMPANY shall be the responsibility of the CONTRACTOR.
- CONTRACTOR shall be responsible for the Fabrication and erection of all structural steel works.
- CONTRACTOR shall be responsible for the arrangement of Equipment shelters and associated foundation and structural works.
- CONTRACTOR shall be responsible for the construction of Concrete pavements/interlocking tiles pavements/Walkways.
- CONTRACTOR shall be responsible for the arrangement of road markings, road furniture, crash barriers, sign boards etc.;
- CONTRACTOR shall be responsible for the construction of Equipment foundations.
- CONTRACTOR shall be responsible for the construction of Safety/ access barriers in site.
- CONTRACTOR shall be responsible for the arrangement of Sign boards, route markers.
- CONTRACTOR shall be responsible for the Painting of structural steel works
- CONTRACTOR shall be responsible for applying the Protective coating for concrete works
- CONTRACTOR shall also be responsible for any other civil/structural/architectural works for the completion of project.
- CONTRACTOR shall be responsible for the construction of foundations for Steel Columns, F&G Detectors, Compressor, generator, lighting poles,

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electrical structures etc. including flooring, brick masonry, plastering, painting and finishing etc.

For further details, please refer to the construction Drawings attached in *Volume-II*.

All Civil WORKS as specified in preceding section 7.7 shall be as per the specifications provided in the annexures attached with the document herein. The provided specifications shall be taken **as minimum requirements** and is not intended to limit or restrict the obligations of CONTRACTOR in respect of the execution of the WORKS and does not relieve the CONTRACTOR of his responsibilities to carry out work according to the relevant international codes and local rules and regulations or implied therein.

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7.8 ELECTRICAL & INSTRUMENT SCOPE OF WORK

7.8.1 SUPPLY AND INSTALLATION WORKS

CONTRACTOR shall be responsible for Supply and Installation of Lightning Protection system and installation of lightning arrestor with suitable conductor and Earth rod along with separate earth pits for Lightning arresters as per the detailed construction drawings attached in *Volume-II* of the document herein, Complete in all aspects and shall install Lightning arresters at the highest points of Light poles.

CONTRACTOR shall be responsible for Supply, Installation of Earthing, Grounding including Construction and installation of earth pits with covers, earth bars, and earthing mesh, with suitable conductor and Earth rod as per detailed design package Complete in all aspects.

CONTRACTOR shall be responsible for installation of Generator (Supplied by Compressor Package vendor) along with cable laying, installation, termination, checking, loop checking, glanding of power cables (Supplied by Compressor packager) from Generators to Electrical Distribution board at Compressor Package.

CONTRACTOR shall be responsible for supply and installation of ESD push at Maru-1 main gate along with fabrication, installation of supports for ESD push button including Civil and foundation works.



CONTRACTOR shall be responsible for supply and installation of instrument cable as specified in E&I BOQ attached in annexures of the document herein, including cable laying, termination at ESD Push button and termination at Compressor control panel under supervision of Compressor Packager.

CONTRACTOR shall be responsible for installation / laying of all cable buried, testing / commissioning from Maru-1 main gate to compressor control panel through a suitable route as buried cable at a certain depth along with cable marking and backfilling.

CONTRACTOR shall be responsible for Installation, laying of cables in cable trays and buried, termination, mounting structure, Glanding, Loop Checking, testing, alignment, bolting of Fire and Gas Detectors supplied by Compressor Packagers complete in all aspects including civil works required for the Installation of Detectors at Compressor under supervision of Compressor Package CONTRACTOR.

CONTRACTOR shall be responsible for Installation, Calibration, testing, checking of F&G Detectors supplied by Compressor Packager along with poles installation including Civil Works Complete in all aspects.

CONTRACTOR shall be responsible for Supply, Installation, Laying, termination, Glanding, Grounding of Lighting fixtures for area lighting, Lighting Junction Boxes, Breakers, DBs, Lighting Cables from lighting fixtures to Lighting Junction boxes and

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Junction Boxes to Electrical power source including Civil works for Lighting Poles, Junction Boxes Complete in all aspects.



CONTRACTOR shall be responsible for the procurement of the materials specified in the E&I BOQ as attached in the annexure of the document herein.

All E&I WORKS as specified in preceding section 7.8 shall be as per the specifications provided in annexures attached with the document herein. The provided specifications shall be taken as **minimum requirements** and is not intended to limit or restrict the obligations of CONTRACTOR in respect of the execution of the WORKS and does not relieve the CONTRACTOR of his responsibilities to carry out work according to the relevant international codes and local rules and regulations or implied therein.

For further details, please refer to the construction Drawings attached in *Volume-II*.

7.9 RED LINE AS-BUILT DRAWINGS:



During construction, the CONTRACTOR shall keep an accurate record of all deviations of his work as actually performed from that shown or indicated on the Drawings by marking the drawings in red ink. Upon completion of the Work, the CONTRACTOR shall deliver to the COMPANY all red lined drawings showing the work as actually performed. All this work shall be responsibility of CONTRACTOR with no cost impact. CONTRACTOR has to make Red line timely along with construction work and have it verified/approved by COMPANY as the works are completed.

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8 GENERAL CONSTRUCTION REQUIREMENTS

CONTRACTOR's Construction Requirements shall include but not limited to the following:

1. Obtaining all required licenses, approvals, and permits for the Works.
2. Establishing Worksite safety rules and providing a Safety Officer and staff for the Works. This will include erecting temporary or permanent fencing to safeguard the Worksite from the entrance of unauthorized parties.
3. Providing CONTRACTOR Representative, temporary Works, Temporary Facilities and other facilities required for the Works.
4. Providing and maintaining accommodation, lodging and transportation for the CONTRACTOR's Personnel, Subcontractors, and Vendors.
5. CONTRACTOR shall provide and maintain in-compliance with local regulations, living accommodation, including utilities and related facilities and services for all resources directly or indirectly employed by it.
6. Managing, coordinating and supervising the Works of its personnel, representatives and Subcontractors, to ensure Works are performed on schedule and in accordance to quality and safety requirements, including preparing detailed schedules for the Works in accordance with the Project and Construction Schedules. Regular monitoring of this schedule shall be the responsibility of the CONTRACTOR and making appropriate adjustments to obtain efficient usage of resources within the timeline specified in section 7.2 of the document herein.
7. Providing schedule and progress reporting in accordance with the requirements of the Contract.
8. Providing and implementing a quality assurance plan and developing and implementing quality control procedures.
9. Maintenance of all temporary facilities required for the Works. CONTRACTOR is responsible to provide temporary access road to Site for use during construction period.
10. Maintaining construction records in formats to be submitted for COMPANY.
11. Ensuring timely mobilization of Vendors' / Sub-Vendors' and Subcontractors' representatives and/or any specialists, and their retention at Worksite for the required duration.
12. Providing site QA/QC and inspection and testing services for the Works. This shall include, but not be limited to civil, structural, painting/coating inspections.

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13. Provision of transport, storage, conservation, operation and maintenance of erection equipment, tools, rigging, cranes, scaffolding, consumable materials etc., inclusive of inspection of, and obtaining the appropriate approvals for use of all construction vehicles, tools and equipment.
14. Transport, receipt, inspection, storage, conservation, handling and administration of all equipment and materials at the Worksite.
15. Protection of all adjacent properties, facilities and environment against damage by construction and erection activities.
16. Protection of equipment and materials and (partially) erected facilities against damage or deterioration by construction activities or by meteorological conditions.
17. Preparing and performing good housekeeping practices and procedures at all areas, including but not limited to the following.
 - ▶ Prevention of undue waste build-up.
 - ▶ Keeping areas tidy.
 - ▶ Keeping roads clean and emergency exit clear.
 - ▶ Containing dust-producing activities.

The construction team individual personnel shall be mobilized as required prior to actual start of construction activities to arrange for permits and necessary coordination between COMPANY and CONTRACTOR. CONTRACTOR shall ensure that the key members of construction team are conversant with English language, administration of first aid and emergency handling procedures.



CONTRACTOR shall obtain security clearance of all of its personnel and sub-CONTRACTOR's personnel from the COMPANY before deputing at Work Site.

CONTRACTOR's Construction Team shall undergo a safety induction program as per COMPANY requirement.

CONTRACTOR shall prepare a detailed mobilization plan and submit to COMPANY for approval at-least two (2) weeks prior to starting mobilization.

CONTRACTOR shall prepare a detailed construction plan and submit to COMPANY for approval at least four (4) weeks in advance prior to starting any construction Works. The construction plan shall cover:

- Site organization with assigned responsibilities.
- Subcontracting strategy for construction work.

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- Construction equipment/machinery/tools separate line layout of temporary facilities including site office, fabrication workshop, NDT facilities, stores, medical, waste disposal transportation, etc.
- Arrangements for construction utilities like construction power, water, potable water, communication, etc., and their distribution network.
- Camp accommodation arrangements for CONTRACTOR's staff.
- Material coordination and handling procedure.
- Construction schedule.
- Construction safety and security.
- Emergency handling and evacuation procedure in-line with the COMPANY procedures.
- Construction work procedures/method statements.
- Construction work sequence.
- Tie-in Schedule and Procedure.
- Quality control during construction and Quality Inspection Plans.

CONTRACTOR shall mobilize experienced and qualified skilled persons of the trade to Worksite.

CONTRACTOR shall mobilize all Construction Equipment at Worksite in a progressive manner.



CONTRACTOR shall establish Site Camp, Office and infrastructure facilities well in advance prior to commencement of site works.

8.1 SITE ORGANIZATION AND FACILITIES

CONTRACTOR shall organize a qualified and competent construction team headed by a Construction Manager for construction work.

The Construction Manager shall be responsible for:

1. All aspects of construction, pre-commissioning, commissioning (assistance in case of Compressor Package only), and hand-over of the new Project Facilities.
2. Coordination and reporting to COMPANY on all construction related matters.
3. Arrangement of all necessary work permits, licenses etc.
4. Interface management with other field Subcontractors.

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5. Coordination with CONTRACTOR's Head Office for all technical and material support.
6. Implementation of CONTRACTOR's HSE Policy and HSE Plan in-line with COMPANY procedures and requirements.
7. Quality Assurance and Quality Control during Construction.
8. To ensure compliance with local laws and regulations during construction.

Construction site facilities will include, as a minimum:

1. Site office with conference room.
2. Fabrication workshop (with lay down facilities).
3. Materials stores (as well as fenced yard covered storage).
4. First Aid/Medical Room, Paramedic staff and ambulance.
5. Area lighting, Safety Sign boards, Fire Protection, Equipment, Telecommunication Equipment.
6. Grit/ sand blasting and painting shop. Location should be selected and necessary arrangements should be made to have minimum dust exposure to existing facilities and population.
7. Toilet, washing rooms, change room.
8. Vehicle and construction equipment maintenance facility.
9. Security & surveillance facilities.

8.2 SITE SURVEY AND ASSESS

1. CONTRACTOR shall be responsible for the protection of existing lines/structures falling within the area of work. If any such line/structure is encountered during the process of excavation or any other activity, the CONTRACTOR shall notify COMPANY/ Engineering Consultant, and shall not proceed until necessary measures are taken for the protection or removal of lines/structures. If any such line/structure is damaged, during the process of operation, the CONTRACTOR shall repair the same at his own cost.
2. CONTRACTOR shall undertake an extensive site survey to familiarize with the project site and the existing COMPANY facilities, which are associated with the Scope of Works;
3. CONTRACTOR shall accept the Worksite "as is where is basis", and undertake the site preparation work.

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4. The Worksite preparation shall include clearance, demolition, rough grading, general earth works, leveling to grade, temporary boundary fencing, opening of roads to Worksite, excavation and backfill as per drawings. The final site levels shall be approved by COMPANY.
5. At the Worksite, CONTRACTOR shall erect a painted wooden notice board giving the following information:
 - COMPANY Name;
 - Contract Title;
 - Contract No.;
 - Main CONTRACTOR Name;
 - Subcontractors Name;
 - Site Location Name;
 - Additional information as directed by COMPANY.



Information shall be stated in both English text and local language. Notice boards shall be self-supporting, and have a minimum size of 2m x 2m.

8.3 LIFTING PROCEDURE INSPECTION AND MAINTENANCE

CONTRACTOR shall submit rigging study for loads of 10 tons and above. All materials and construction equipment at work sites that must be off loaded at the point of entry, loaded onto a transport vehicle, moved to and installed/erected at the site shall comply with a lifting/movement procedure covering each of these phases of the work. CONTRACTOR shall accordingly prepare a “Lifting Procedure” and a “Movement Procedure” as part of the Construction Planning Prior to any lift or movement. CONTRACTOR shall obtain and have at the location of the lift as a minimum the following:

- All required certificates for all cranes, slings, shackles, operator qualifications
- All appropriate approvals as defined by the Lifting Procedure. Minor, medium size and heavy lifts can be carried out using a standard lifting procedure identified in the Lifting Procedure, to be submitted within the Construction Plan and included in the Construction Manual.

The Lifting Inspection and Maintenance Procedure shall include at least the following requirements:

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- Certificates from recognized bodies are required for operators of all Lifting Equipment. Copies of such certificates are to be held in the operator cabin of the equipment.
- The procedure shall state the inspection regime for lifting tackle and how this is visually examined and tested and how an inventory of all inspection records is filed, maintained and the lifting tackle identified.
- CONTRACTOR shall undertake periodic inspection of lifting tackle including hooks, chains, slings, rings, links, shackles, swivels, pulley blocks, chain blocks and spreader beams. Each item of lifting tackle is to be addressed in its own test certificate and distinctly marked.
- CONTRACTOR shall undertake periodic inspection of all lifting equipment & accessories for example wire ropes, etc. and ensure that the manufacturer's test certificates for said items are available and are in order.
- When undertaking periodic inspection of wire ropes, slings and other accessories CONTRACTOR is to examine the entire length for signs of damage.



8.4 TRANSPORTATION AND LOGISTICS

When transporting Materials and Construction Equipment to site, the CONTRACTOR shall prepare a transport plan showing suitability for the lifting and transport of the projected loads for the individual material, equipment and selected vehicles and mobile crane and the selected route with the roads to be used. Based on the transport plan, CONTRACTOR shall obtain all necessary approvals from COMPANY, local authorities, and prior to the commencement of the transport to the site and shall be responsible, without limitation, for making any road required to accommodate the transportation of Material, Equipment, construction Equipment and all procured and supply items included in the CONTRACTOR's scope; to site in accordance with the transport plan.



8.5 SAFETY

CONTRACTOR shall take sole responsibility for safety (including fire and loss prevention) of the Works and shall comply in all respects with the requirements of Project Plan. The scope of safety shall include the following as a minimum:

1. Providing safety and fire prevention procedures and equipment at Worksite;
2. Providing emergency evacuation and first aid facilities in accordance with the COMPANY requirements, for all personnel assigned to the Worksite;

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3. Providing and implementing adequate safety management and personnel, safety procedures, safety plans, safety organization charts, safety instructions, emergency response plan and safety talks;
4. Supervising all personnel assigned at Worksite to ensure that they abide by Project HSE Plan and procedures in-line with COMPANY procedures and requirements;
5. Regularly verifying adequacy of CONTRACTOR and Subcontractor' crane-age, rigging and scaffolding to function safely and reliably in compliance with COMPANY requirements;
6. Maintaining safety records, issuing safety report to COMPANY as part of progress reports, Providing security fence and gates and surveillance at various areas on Work Site;
7. Provide personnel safety apparel to all its personnel and ensuring its Subcontractors personnel are also provided likewise. CONTRACTOR's personnel shall be fully equipped with personal safety protection equipment, as required, during performance of work at site. No loose clothing and normal shoes shall be allowed.
8. CONTRACTOR shall also ensure that adequate first aid facilities and medical supply are available at all times for its's personnel. Wind shields, spray guards, adequate drinking water, toilet facilities, clinic and first aids equipment shall also be provided by CONTRACTOR, at worksite;
9. CONTRACTOR shall strictly comply with all local, municipal, territorial, provincial and federal laws, orders, and regulations pertaining to health and safety which are applicable to the location where the Works are being performed. CONTRACTOR shall prepare Safety Manual in-line with COMPANY procedures and requirements for COMPANY review and approval. The manual shall be strictly adhered throughout the duration of the project.

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9 GENERAL REQUIREMENTS

As part of temporary facilities, arrangement of following shall also be in CONTRACTOR's scope:



- Arrangement for potable water for concreting, sand pad compaction and curing purposes
- Adequate lighting arrangements for security and night works as required.
- Supply of all materials forming part of the permanent works
- Mobilization of survey equipment and personnel and performance of site surveys.
- Housekeeping during construction and clearance of site on completion of works.
- Barricading site construction areas and putting up safety signs as required
- Holding of daily site safety meetings and discussions.
- Maintaining daily site work progress record including deployment of manpower, equipment resources & weather conditions including any work stoppages with reasons thereof.
- Measurement books for works being carried out.
- Firefighting equipment and facilities at CONTRACTORs site facilities.
- Setting up of laboratory at site for compaction testing for filling.
- Setting up of adequate medical facility supported by doctor, compounder, ambulance and first aid kit(s).

The land for setting-up temporary facilities for storage of construction equipment & material, work area including workshops and staff residence, shall not be provided by the COMPANY with no risk / obligation to COMPANY. Land for setting up of temporary facilities shall be arranged at CONTRACTOR's cost. CONTRACTOR shall be responsible for securing the land against flooding, law and order situation and other risks.

9.1 **SITE MOBILIZATION**

CONTRACTOR shall mobilize the construction management team, dedicated for the construction work, to Worksite in a progressive manner.

CONTRACTOR's construction team will include, as a minimum:

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1. Site Manager;
2. Construction Manager(s);
3. Construction Engineers, Supervisors (Discipline-wise);
4. QA/QC Engineers;
5. Safety Officers;
6. Stores/Materials Controller;
7. Administration Officer;
8. Planning Engineer;
9. Commissioning Support Engineer;
10. Engineering Support Staff;
11. Document Controller;

The above personnel shall have suitable qualification and experience. The construction team individual personnel shall be mobilized as required prior to actual start of construction activities to arrange for permits and necessary coordination between COMPANY and CONTRACTOR. CONTRACTOR shall ensure that the key members of construction team are conversant with English language, administration of first aid and emergency handling procedures.



CONTRACTOR shall obtain security clearance of all CONTRACTORS'/sub-CONTRACTOR's/vendor's personnel before deputing at Work Site;

CONTRACTOR's Construction Team shall undergo a safety induction program as per COMPANY requirement;

CONTRACTOR shall prepare a detailed mobilization plan and submit to COMPANY for approval at-least two (2) weeks prior to starting mobilization;

CONTRACTOR shall prepare a detailed construction plan and submit to COMPANY for approval at least four (4) weeks in advance prior to starting any construction Works. The construction plan shall cover:

- Site organization with assigned responsibilities;
- Subcontracting strategy for construction work;
- Construction equipment/machinery/tools separate line layout of temporary facilities including site office, fabrication workshop, NDT facilities, stores, medical, waste disposal transportation, etc.;
- Arrangements for construction utilities like construction power, water, potable water, communication, etc., and their distribution network;
- Camp accommodation arrangements for CONTRACTOR's staff;

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- Material coordination and handling procedure;
- Construction schedule;
- Construction safety and security;
- Emergency handling and evacuation procedure in-line with the COMPANY procedures;
- Construction work procedures/method statements;
- Construction work sequence;
- Tie-in Schedule and Procedure;
- Quality control during construction and Quality Inspection Plans;

CONTRACTOR shall mobilize experienced and qualified skilled persons of the trade to Worksite;

CONTRACTOR shall mobilize all Construction Equipment at Worksite in a progressive manner.

CONTRACTOR shall establish Site Camp, Office and infrastructure facilities well in advance prior to commencement of site works.

9.2 SITE ORGANIZATION AND FACILITIES



CONTRACTOR shall organize a qualified and competent construction team headed by a Construction Manager for construction work.

The Construction Manager shall be responsible for:

1. All aspects of construction, pre-commissioning, commissioning support, and hand-over of the new Project Facilities;
2. Coordination and reporting to COMPANY on all construction related matters;
3. Arrangement of all necessary work permits, licenses etc.;
4. Interface management with other field Subcontractors;
5. Coordination with CONTRACTOR's Head Office for all technical and material support;
6. Implementation of CONTRACTOR's HSE Policy and HSE Plan in-line with COMPANY procedures and requirements;
7. Quality Assurance and Quality Control during Construction;
8. To ensure compliance with local laws and regulations during construction.

Construction site facilities will include, as a minimum:

1. Uninterrupted supply of all utilities.

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2. Site office with conference room;
3. Fabrication workshop, prefabrication sheds (with lay down facilities);
4. Materials stores, warehouses (as well as fenced yard covered storage);
5. First Aid/Medical Room, Paramedic staff and ambulance;
6. Area lighting, Safety Sign boards, Fire Protection, Equipment, Telecommunication Equipment;
7. Grit/ sand blasting and painting shop. Location should be selected and necessary arrangements should be made to have minimum dust exposure to existing facilities and population;
8. Toilet, washing rooms, change room, messing facilities, sewage disposal etc.
9. Vehicle and construction equipment maintenance facility;
10. Security & surveillance facilities.

9.3 WORK PERMIT PROCEDURE

CONTRACTOR is responsible to ensure that CONTRACTOR's Personnel, Subcontractor, vendor other personnel strictly adhere to the requirement of COMPANY's Work Permit Procedure.

9.4 SITE SURVEY AND ASSESS

1. CONTRACTOR shall undertake an extensive site survey to familiarize with the project site and the existing COMPANY facilities, which are associated with the Scope of Works;
2. CONTRACTOR shall accept the Worksite "as is where is basis", and undertake the site preparation work.
3. The Worksite preparation shall include clearance, demolition, relocation of existing facilities, rough grading, general earth works, leveling to grade, temporary boundary fencing, opening of roads to Worksite, excavation and backfill as per drawings. The final site levels shall be approved by COMPANY.
4. At the Worksite, CONTRACTOR shall erect a painted wooden notice board giving the following information:
 - ▶ COMPANY Name;
 - ▶ Contract Title;
 - ▶ Contract No.;
 - ▶ Main CONTRACTOR Name;
 - ▶ Subcontractors Name;



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- ▶ Site Location Name;
 - ▶ Additional information as directed by COMPANY.
5. Information shall be stated in both English text and local language. Notice boards shall be self-supporting, and have a minimum size of 2m x 2m.

9.5 SAFETY

CONTRACTOR shall take sole responsibility for safety (including fire and loss prevention) of the Works and shall comply in all respects with the requirements of Project Plan. The scope of safety shall include the following as a minimum:

1. Providing safety and fire prevention procedures and equipment at Worksite;
2. Providing emergency evacuation and first aid facilities in accordance with the COMPANY requirements, for all personnel assigned to the Worksite;
3. Providing and implementing adequate safety management and personnel, safety procedures, safety plans, safety organization charts, safety instructions, emergency response plan and safety talks;
4. Supervising all personnel assigned at Worksite to ensure that they abide by Project HSE Plan and procedures in-line with COMPANY procedures and requirements;
5. Regularly verifying adequacy of CONTRACTOR and Subcontractor' crane-age, rigging and scaffolding to function safely and reliably in compliance with COMPANY requirements;
6. Maintaining safety records, issuing safety report to COMPANY as part of progress reports, Providing security fence and gates and surveillance at various areas on Work Site;
7. Provide personnel safety apparel to all its personnel and ensuring its Subcontractors and Vendors personnel are also provided likewise. CONTRACTOR's personnel shall be fully equipped with personal safety protection equipment, as required, during performance of work at site. No loose clothing and normal shoes shall be allowed;
8. CONTRACTOR shall also ensure that adequate first aid facilities and medical supply are available at all times for CONTRACTOR's personnel. Wind shields, spray guards, adequate drinking water, toilet facilities, clinic and first aids equipment shall also be provided by CONTRACTOR, at worksite;
9. CONTRACTOR shall strictly comply with all local, municipal, territorial, provincial and federal laws, orders, and regulations pertaining to health and safety which are applicable to the location where the Works are being performed. CONTRACTOR shall prepare Safety Manual in-line with COMPANY procedures and requirements for COMPANY review and approval. The manual shall be strictly adhered throughout the duration of the project.

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10 PROCUREMENT AND SUPPLY

10.1 GENERAL

In general, the major equipment (Compressor & Separator Packages along with the loose items as detailed in the List of Loose-Shipped Items provided in *Volume-II* of the tender document) shall be provided to the CONTRACTOR as free-issue.

In addition to piping, electrical & instrumentation bulk material, required equipment and other items as per this scope of work for installation at Maru-1 wellhead, all other material and consumables required for the execution of the project shall remain CONTRACTOR's responsibility.

CONTRACTOR shall be responsible for procurement, coordination and expediting with the vendors to ensure that all materials under its scope arrive on site timely and as per schedule. All CONTRACTOR' supplied material shall be 100% traceable and suitably marked for easy identification of manufacturer or supplier, grade, source, size and rating. CONTRACTOR shall submit the expediting system / mechanism for its vendors / subcontractors in his technical bid. CONTRACTOR shall also mention the software / procedure used for material tracking at different project stage.

All procurement and supply activities shall be subjected to COMPANY's approval.



All procured equipment / material shall be new and covered with a manufacturer' warrantee in COMPANY's name and extending through and fully covering the Maintenance or warranty period specified in the Bid Package. The warrantee period shall be specified to the equipment / material manufacturers / supplier by the CONTRACTOR after taking due cognizance of the approved project schedule. At the time of issue of Mechanical Completion Certificate all equipment / material warrantees shall be delivered to COMPANY, where applicable

COMPANY may also instruct the CONTRACTOR to procure certain items identified during execution stage of the Project. The CONTRACTOR shall ensure that the supply of items identified during execution stage of the project procured from local / foreign sources within limited time and avoiding any impact on project timeline.

Management, planning, Shipping, delivery, inland transportation and offloading at port and site for equipment / material procured by the CONTRACTOR, shall be part of the CONTRACTOR's scope and CONTRACTOR's cost.

For further details of the material to be procured, the bidder shall refer to Bill of Quantities (BOQs) attached in annexures of the tender document.

The CONTRACTOR shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances including the variation in price of material of construction, cost of living, labor cost, etc. which may influence or

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affect the Work. By signing the Contract, the CONTRACTOR accepts responsibility for having foreseen all difficulties and cost for successfully completing the Work.

10.2 COMPLIANCE WITH APPROVED VENDOR LIST

CONTRACTOR shall procure items, under its scope of supply, from Approved vendors list as provided with the BOQs in the document herein.

Any deviation / exception from the approved vendors List shall be clarified by the CONTRACTOR during bid clarification stage and approval shall be sought from COMPANY. Any deviation from approved vendors and recommendation of alternate equivalent vendor by the CONTRACTOR, after award of CONTRACT, shall not be entertained. CONTRACTOR shall explicitly provide reasons for opting for alternate equivalent vendor along with supporting documentation, such as, experience, capabilities etc. must be provided along with proofs of previous successful working relationship with selected vendor.

The Procurement Plan to be submitted as part of the technical bid shall clearly demonstrate CONTRACTOR's capability to procure equipment / material in the limited time available to ensure project completion on fast track basis. The procurement sources shall also be identified in each progress report.

10.3 ORDERS



The CONTRACTOR shall, prior to placing order(s) for equipment / materials, provide the COMPANY with documentation for their review and approval of the supplier, technical bid comparison, vendor data requirements, quality plan, spares recommendations, delivery date, shipping details and warranty.

COMPANY reserves the right to ask for a sample or a lab test for review of quality of the material. Local procurement shall be carried out after approval of COMPANY. The CONTRACTOR shall provide similar data as appropriate to items such as instruments, electrical equipment, structures and other materials.

The CONTRACTOR shall ensure that all questions, reservations etc. are satisfactorily resolved with suppliers prior to issue of the Purchase Order, either by correspondence for minor issues, or by pre-award discussions. The COMPANY shall be invited to attend the technical part of such discussions; however, attending such discussions / meetings shall be at the discretion of the COMPANY.

10.4 RECEIVING INSPECTION & STORAGE

COMPANY's gate pass system shall be followed especially for outward movement of material from site. CONTRACTOR shall keep the COMPANY informed about the receiving inspection schedule for all incoming material / equipment of CONTRACTOR scope of supply. COMPANY at its own discretion may be involved in the receiving

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inspection and CONTRACTOR shall fully oblige the COMPANY representative(s) to perform the receiving inspection.

The CONTRACTOR shall also be responsible for maintaining a proper warehouse at Project Site by employing a storekeeper to keep up to date record of the equipment/material issued & consumed. The CONTRACTOR will have to submit a complete material balance/audit report after completion of the job.

Bearings and other machined wearing surfaces of machinery shall be protected against corrosion, and shall be kept clean.

Structural steel, miscellaneous steel, grating walkways, plate-work, cable trays, etc., shall be kept painted throughout the storage and erection period to prohibit rusting unless such items are galvanized or have other corrosion proof finish.

Thermal insulation if used for the project shall be stored indoors, or otherwise protected against getting wet.

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11 COMPANY AND CONTRACTOR RESPONSIBILITIES



11.1 COMPANY'S RESPONSIBILITIES

COMPANY will, but is not obliged to, provide assistance to CONTRACTOR in securing necessary permits or data from the Government of Pakistan's authorities and /or agencies when required under this Contract. Failure by COMPANY to obtain and provide such assistance shall not relieve CONTRACTOR from its obligation to secure the same at its own costs.



11.2 CONTRACTOR'S RESPONSIBILITIES

In addition to the activities summarized herein above, CONTRACTOR shall also carry out the following Works:

1. The CONTRACTOR shall be responsible for the acquirement/arrangement of space required for all temporary facilities in order to carry out the said WORKS with due diligence, outside the confines of Maru-1 Wellhead during installation phase.
2. Accepting the Worksite on an "as is where is" basis and completing site preparation work, including dismantling of existing facilities, temporary access, roads, tracks etc., as required for the Works;
3. Provision of services of an independent, recognized third party inspection agency as required and including all inspection tools for critical items as defined under relevant section in this document;
4. Preparation and submission of all Construction and Quality Control documentation for COMPANY review, comments and approval. Approval of documents by COMPANY does not relieve CONTRACTOR of his contractual obligations and guarantees under this Contract.
5. For any additional material, Procurement services and supply, including inspection, expediting, coordination, acceptance, forwarding, payment of legal and applicable taxes and fees, payment of customs duty, customs clearance of equipment, transportation to site and bulk materials. Performing all material tendering, evaluation of bids and shall place purchase orders, for all materials and equipment and deliver to site in a timely manner, per project schedule requirements;
6. Provision, operation and maintenance of temporary construction and infrastructures facilities, and removal of the same after completion of the Works which shall include the provision to provide temporary access road for construction purposes;
7. CONTRACTOR shall pay special attention and take all essential measures to ensure dust control while undertaking the site works.
8. Implement requirement of Worksite storage and protection for all procured/relocated equipment and materials;



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9. Assignment of personnel, materials, equipment and support as required in performing the Works.
10. Warranting that the personnel, material, equipment, consumables and logistical requirements are provided to ensure effective and safe performance of the Works. CONTRACTOR shall not change personnel assigned to the Project without prior approval from COMPANY.
11. Implementing a system of progress reporting by which COMPANY remains regularly informed of the status of the Works.
12. Provision of inspection and testing services, welding qualification procedures and test, facilities, equipment, materials, consumables and documentation necessary for inspection and testing at all stages of the Works, all as defined in the Contract and in accordance with other inspection requirements.
13. CONTRACTOR shall ensure that during work execution all the gaskets, nuts & bolts shall be witnessed and verified by the COMPANY before installation. CONTRACTOR and COMPANY representatives shall witness and sign all such records.
14. Procure and make available all equipment and materials necessary for the successful Construction, Pre-Commissioning and Warranty Maintenance in accordance with the Scope of Work, specifications and drawings.
15. Development and implementation of a comprehensive equipment and bulk materials control, traceability and tracking system throughout all phases of Procurement, Installation, Pre-Commissioning, and Commissioning support.
16. Construction works, including site survey, verification of existing underground services, site preparation, pre-fabrication, fabrication, installation and erection as required in accordance with the Scope of Works, specifications, drawings, etc. as defined in the Contract.
17. CONTRACTOR is responsible to verify and locate all the existing services and protect them during the Works execution. CONTRACTOR is deemed to include all the costs associated with the verification, protection, relocation and demolition of the existing services in the scope.
18. Provision, operation and maintenance of accommodation camps and other temporary facilities including any temporary safety equipment and facilities during Construction, Pre-Commissioning, and Commissioning assistance as required for the performance of the Works for CONTRACTOR's workers.
19. Provide all expendable / consumable construction supplies, fuel and lubricant for construction requirements including safety items (hard hats, eye goggles, etc.) for CONTRACTOR's workers.
20. Provision of general site security, including security for CONTRACTOR's work and

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accommodation areas, equipment, materials and tools, and also barricades or fencing of the Works areas as required.

21. Reconciliation of spares and materials used during Construction, Pre-Commissioning and commissioning activities.
22. Disposal of construction surplus and scrap during execution and upon completion of the Works to a designated place with COMPANY's consent.
23. CONTRACTOR shall clean-up Worksite and reinstatement of surrounding areas after completion of Works.
24. CONTRACTOR shall liaise with COMPANY for all the interfacing Works with existing facilities and for the supply of feed for Commissioning and Start-up.
25. Providing housekeeping at Worksite including construction, accommodation and storage areas throughout the duration of Works.
26. Provision of Construction of All Risk Insurance and all other insurance requirements.
27. Provision of all requirements required for execution of Works, but not limited to all consumables necessary for the testing, flushing, pre-commissioning, and commissioning services of the in-plant piping, process equipment, valves and instruments.
28. Provision of all water required for potable (fit for drinking), utility and hydro-test.
29. Provision of Nitrogen and other mediums required for the testing and commissioning of the works underlined in section 7 of the document herein.
30. Provision of food & dining, accommodation, religious and sanitary facilities for CONTRACTOR's personnel stationed at site.
31. Mobilizing all equipment, materials, consumables and personnel to and from the site.
32. Providing adequate temporary lighting arrangements for Site Works.
33. Obtaining necessary permits as per the COMPANY's PTW Procedure to perform any work.
34. Provision of Warranty Team to manage and repair all warranty defects items after commissioning up to Final Acceptance of the plant.
35. The contractor shall adhere to the complete Implementation of COMPANY's HSE Policy, HSE Plan and COVID-19 Protocols/SOPs, which may require COVID testing of all CONTRACTOR's/sub-CONTRACTOR's personnel to be deputed at site on CONTRACTOR's own expense. The CONTRACTOR shall also ensure the supervision of workforce (assigned at worksite), adheres to the social distancing policies at their designated accommodations as well as on site and to warrant that they shall abide by COMPANY's HSE Plan, COVID-19 restrictions/measures and procedures.

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11.2.1 SUB-CONTRACTING

The CONTRACTOR shall not subcontract the whole of the Work. CONTRACTOR shall only undertake construction using specialist Subcontractors fully conversant with the activity they have been selected for. The Subcontractors proposed by the CONTRACTOR shall be named in his bid for COMPANY's review and approval.

To this effect, CONTRACTOR shall submit the following as a minimum for the review and approval of the COMPANY:



- The intended appointment of a subcontractor for a part of the Work, with detailed particulars, which shall include the relevant experience of the subcontractor whom the CONTRACTOR intends to appoint.
- Qualification and experience of the sub-contractor's staff as may be asked by COMPANY.
- Details of manpower and other resources available with the subcontractor.
- The intended commencement of each sub-contractor's Work on Project Site.

COMPANY, after reviewing the above information shall give his approval for the intended sub-contracting arrangement. The CONTRACTOR shall be responsible for the acts or defaults of any subcontractor, his agents or employees, as if they were the acts or defaults of the CONTRACTOR.

The approved sub-contractor shall not be allowed to further sub contract the Work under his scope. If more than one sub-contract is awarded to one subcontractor it shall not be managed by the same team simultaneously. Approval of a sub-contractor by COMPANY shall not release the CONTRACTOR of any of its obligation and responsibilities under the Contract and the COMPANY shall not have any obligation with regard to the sub-contracting arrangement between the CONTRACTOR and the sub-contractor.

Approved sub-contractor shall be responsible for carrying out the Work in accordance with the requirement of the Contract Documents, and all conditions of the Contract shall be applicable to him.

If a sub-contractor is proposed during the course of the project and is critical to the execution and completion of project, CONTRACTOR shall submit complete details (as indicated above or as requested by the COMPANY) along with reason for engaging the sub-contractor, for COMPANY's review and approval, at least two (02) weeks prior to the requirement of sub-contracting.

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12 HEALTH, SAFETY AND ENVIRONMENT

12.1 GENERAL

12.1.1 Policy Statement and Objectives

CONTRACTOR shall conduct its operations in such a manner as to:

- ▶ Provide a safe working environment.
- ▶ Ensure the safety and health of CONTRACTOR's crew and personnel working within CONTRACTOR directed areas of operation.
- ▶ Protect the public from injury or ill health and prevent loss or damage to properties resulting from its activities.
- ▶ Ensure and safeguard the conservation of the environment.

12.1.2 Safety Targets

In taking steps to ensure a safe working environment, CONTRACTOR shall aim for:



- ▶ No fatalities.
- ▶ No loss time and any significant accidents.
- ▶ No roll over to vehicles.

12.2 LEADERSHIP AND GOVERNANCE

The CONTRACTOR is expected to provide the tools, knowledge and support to develop a culture where all personnel demonstrate leadership and are motivated to proactively contribute to continual improvement of HSE performance. Though the combined program will be known as the HSE Program the expectation is that the CONTRACTOR will cover the various key topics with their own individual plans, covering the specific component details that will support the overall Site Specific requirements.

These plans will address at a minimum the following key topics; Health and Safety, Environmental, Security, Crisis and Emergency Management, HSE Risk Management and Construction – Field Execution. The CONTRACTOR shall submit for review and acceptance their Site Specific HSE Program complete with all of the plans and including the applicable procedures to comply with these requirements.

Compliance with regulatory requirements, minimum COMPANY requirements, utilizing industry best practices, as well as identifying a program review and maintenance approach to ensure a high-quality Site Specific HSE program, shall be part of the contractual commitment. Any deficiencies noted will be brought to the attention of the CONTRACTOR by COMPANY and / or it's Representative. Any failure to take appropriate corrective action will result in non-compliance and formal review of the

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issue. COMPANY and /or its Representative have the right to stop work on the site for the period required to complete a formal review and rectification of the issues. Any stoppages for this cause will not be justification for delays to the work or a basis for additional work claims.

The CONTRACTOR must engage in clear communications with its personnel, COMPANY and / or its Representative and subcontractors on HSE issues. The CONTRACTOR and any subcontractors are required to maintain Site Specific HSE programs that meet all current applicable regulatory requirements, including any required licensing / certifying of workers, inspections and certification of equipment. Any Vendors visiting site shall be required to adhere to the Site Specific HSE program. The CONTRACTOR and any subcontractors must also frequently audit these Site Specific HSE programs and update their programs to reflect any regulatory changes.

Regulatory officials may wish to gain access to the project for investigation or inspection purposes. Overall responsibility for coordinating the general activities of regulatory personnel while on the project lies with COMPANY and / or it's Representative. The CONTRACTOR and subcontractors must share knowledge of an unscheduled inspection. COMPANY and / or its Representative will act as escorts and observers, if permitted, during all regulatory inspections. Regulatory officials are visitors to the project and must attend an HSE orientation suitable for visitors. Copies of government inspection reports must be provided to COMPANY and / or it's Representative upon receipt from the government organization.



HSE documentation, document control and HSE records must be maintained by the CONTRACTOR for effective implementation of their Site Specific HSE program and their Site Specific HSE Execution Plan.

The CONTRACTOR Monthly Report shall record incident statistics as a record of the performance and improvement of the Site Specific HSE Program. The CONTRACTOR Monthly Report shall be submitted to COMPANY and / or it's Representative on or before the 3rd of each month for data collected from the previous month.

12.2.1 Implementation Aspects

The policy is implemented with special attention to the following specific aspects:

- ▶ The requirements of all relevant government legislation are followed;
- ▶ COMPANY standards, specifications, procedures and regulations are applied;
- ▶ Safety is given equal importance to productivity and cost;
- ▶ Each employee is given specific procedures related to his work;
- ▶ Each employee receives suitable technical and safety training;
- ▶ Work instructions are clear and pay due regard to safety requirements;

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- ▶ Experience gained, lessons learned from accidents/incidents and new technical developments to be widely distributed amongst staff;
- ▶ To submit measures and standards in practice in regard to the protection of the Environment, Safety and Health to COMPANY, that complies with COMPANY policy and standards;
- ▶ To maintain an effective HSE Management System that covers all aspects of the activities;
- ▶ To maintain complete documentation of all procedures and manuals relating to the work, including accident/incident reporting;
- ▶ Shipment of regulated hazardous materials to COMPANY must be consigned to COMPANY's destination in full compliance with shipper and carrier responsibilities as stipulated by the applicable, international, national, provincial and local laws/regulations/practices, relating to packaging, documentation, handling, use, storage and disposal;
- ▶ Worksite, work areas are designed, built and operated in such ways that work can be carried out safely and in an environmentally sound manner;
- ▶ Only materials, tools and equipment which meet high standards are used;
- ▶ The safety aspects of Worksite, work area, materials and tools are reviewed continually;
- ▶ CONTRACTOR is required to adopt and maintain the same high standards as per COMPANY requirement;
- ▶ All work carried out, whether by CONTRACTOR or its Subcontractors, is effectively monitored by CONTRACTOR;
- ▶ A regular safety meeting to be held at all levels in the organization to ensure safety occupies important aspect of work planning and execution.

12.3 RESPONSIBILITY

12.3.1 Unit Safety Officer

CONTRACTOR shall have at all times a fulltime responsible person appointed as the crew's Unit Safety Officer. The Unit Safety Officer shall oversee all matters pertaining to safety in all crews operation and shall

- ▶ Conduct fortnightly safety meetings with all his crew.
- ▶ Follow-up safety items raised during safety meetings.
- ▶ Ensure accident/incident reports are completed and forwarded to the COMPANY's Representative within twenty-four (24) hours.

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- ▶ Set up a system to enhance the safety attitudes and awareness of all his crews.
- ▶ Participate in safety program or meeting conducted by COMPANY.
- ▶ Arrange or participate in the accident/ incident investigation.

12.3.2 All Personnel

It is the responsibility of every personnel to maintain a safe working environment, both at his assigned work place and in other parts of the survey area.

Inappropriate conduct or mischievous acts shall not be allowed, as this presents a safety hazard to the entire crew. Subject to regulation enforced, firearms, weapons, prohibited drugs or alcohol shall not be allowed at base camp or work place

All CONTRACTORS' Personnel are to undergo an annual medical check-up at CONTRACTOR expense, to certify their fitness for duties in harsh environment. Valid medical certificates are to be kept together with the personnel records for inspection purposes.

12.4 TRAINING REQUIREMENTS

12.4.1 First Aid, Resuscitation and Fire-Fighting

- ▶ There must be an adequately trained first aider at work location;
- ▶ All personnel must be trained to operate fire-fighting equipment at their own workstations.



12.5 OPERATION OF MAJOR EQUIPMENT / MACHINERY

- ▶ Formal training must be provided for operators of major equipment / machinery;
- ▶ Trainee shall not be left to work unsupervised.

12.6 SAFETY MEETINGS AND AUDITS

12.6.1 Safety Inspections/Audits

Prior to Works, CONTRACTOR's equipment shall be inspected by COMPANY Representative(s), satisfied for operation and must meet all COMPANY safety specifications and regulations. Subsequent inspections will be made to ensure that proper actions have been taken to rectify earlier identified unsafe situations and that equipment is in working order.

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12.6.2 Safety Awareness / Meetings

CONTRACTOR must be responsible for maintaining and enhancing the safety awareness of its personnel and Subcontractor personnel, including arranging and/or participating in regular safety meetings/briefing and emergency drills.

The objectives of safety meetings are to:

- ▶ Provide opportunities for personnel to voice their concern over unsafe situations or procedures in their respective work places;
- ▶ Provide information and warning for other personnel in regard to potential or existing hazards;
- ▶ Allow collective solutions to be put forward through discussion.

It is COMPANY's requirement that all CONTRACTORS' Personnel attend regular safety meetings and names of attendees shall appear on the minutes of such meetings. Non-attendance at a safety meeting must be authorized by a responsible person and a reason for non-attendance must be given in the minutes.

12.6.3 Frequency



- ▶ The meeting shall be held fortnightly and include a safety talk or presentation on a chosen subject aimed at enhancing safety awareness on site.
- ▶ Safety audits shall be conducted by the respective Safety Officer in conjunction with the COMPANY Representative on a monthly basis or whenever deemed necessary.

12.6.4 Tool Box Meeting

CONTRACTOR shall conduct Tool Box Meeting at the work place in the morning before start of the work about the nature of job to be done. What are the safety aspects to be observed and whom to contact in case of emergency. Tool box meeting shall be conducted by authorized Safety Officer.

12.6.5 Reporting

- All safety meetings are to be minute and forwarded to COMPANY Representative;
- All emergency drills are also to be forwarded to the COMPANY's Representative;
- All safety audits are to be reported to COMPANY's Representative monthly, with action points listed;

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- All accidents and incidents related to the survey shall be reported in accordance with COMPANY Accident Reporting Procedure, within twenty-four (24) hours in the event of:
 - Any loss of or damage to material or equipment supplied by either COMPANY or CONTRACTOR.
 - Any personal injury to any COMPANY or CONTRACTOR's Personnel, its agents or Subcontractors.
 - Any injury to any third party.
 - A near miss incident.

A full detailed report via written or email sent to COMPANY within twenty-four (24) hours and an Accident or Incident Report filled out by CONTRACTOR's HSE Manager immediately.

12.6.6 Field Execution

The CONTRACTOR's Site Specific Health and Safety Execution Plan shall include, but is not limited to the following safety elements as applicable to the work:

- CONTRACTOR Site Procedures
- Site Access and Minimum Requirements
- Responsibility, Accountability and Disciplinary Action
- Personal Protective Equipment (including Atmospheric Monitoring)
Maintaining Protective Equipment
- Job Safety Planning/Analysis (JSP/JSA)
- Protection from Excessive Noise
- Working near Live Equipment
- Working at Heights
- Working with and Disposal of Hazardous Material / Chemicals
- Safety Meetings
- Joint Health and Safety Committee (JHSC)
- Incident Reporting and Investigation
- Emergency Procedures
- Lock Out / Tag Out (Work Protection)
- Floor and Roof Openings
- Safety Barriers/Barricades

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- Craning/Hoisting Equipment
- Rigging and Heavy Lifts
- Explosive Actuated Tools
- Excavations and Trenching
- Confined Space Program
- Fire Protection
- Scaffolding
- Rescue Procedure (ERT)
- First Aid
- Smoking in the Workplace
- Vehicle traffic on site (Equipment & Vehicle Pre-use Inspections to ensure equipment and vehicles continue to be maintained at an appropriate level)
- Tailboard/Tool Box

12.7 SAFETY TOOLS AND EQUIPMENT



The use of correct, properly designed and serviceable tools and safety equipment is required. All working personnel should be taught the proper and correct way of using safety tools and equipment.

12.7.1 Fire-Fighting Equipment

- Fire-Fighting systems are to be checked and tested periodically;
- All fire extinguishers are to be checked and certified twice annually;
- Fire extinguishers and fire hose stations are to be prominently marked and located at all the construction site;
- Fire water pump to be inspected, serviced regularly and maintained in operational mode at all times;
- Alarm system to be tested during every drill

12.7.2 First Aid and Survival Equipment

- Adequate number of first-aid boxes and resuscitation units are to be placed at strategic points;
- First aid boxes are to be inspected regularly and stocks replenished;

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- Prescription drugs are to be certified and administered by pharmacist and kept under lock.

12.7.3 Protective Equipment

- All protective equipment shall be of types manufactured to standards and approved by COMPANY;
- Protective equipment shall be worn at all times at the Work areas;
- CONTRACTOR is responsible to ensure that all workers are supplied with PPE, i.e. safety hat and safety boots, etc. as a minimum.

12.8 HOUSEKEEPING

CONTRACTOR shall ensure good housekeeping at the Work Areas. Washrooms and toilets shall be serviced regularly.

12.9 EMERGENCY EQUIPMENT AND PROCEDURES

12.9.1 Emergency Procedures

CONTRACTOR shall have in place an Emergency Response Procedure (ERP) describing in detail the communication system, site emergency response operation, duties and responsibilities of personnel and action to be taken in the event of an emergency.

CONTRACTOR ERP, which is to be consistent with the COMPANY ERP, shall be reviewed and approved by the COMPANY prior to the commencement of the Works.



12.9.2 Emergency Response

CONTRACTOR shall provide adequate first aid, firefighting, lifesaving and other safety equipment and shall maintain this equipment in a professional manner and where appropriate re-certify as dictated by legal and industry standards. CONTRACTOR shall keep up-to-date records of all said equipment, including equipment location plans.

CONTRACTOR shall provide a designated vehicle to be used as an ambulance at Worksite.

12.10 ACCIDENT REPORTING AND INVESTIGATION

Accident is defined as any unintentional or unplanned event or condition which has or could have resulted in injury to a person and loss or damage to equipment, plant or property.

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It is COMPANY requirement that all accident, no matter how trivial, must be reported to COMPANY's Representative. CONTRACTOR shall ensure that its employees are aware of this mandatory requirement.



CONTRACTOR shall be responsible to investigate, in a professional manner, all accidents that occur during the performance of the Works and the investigation report shall be made available to COMPANY within twenty four (24) hours of its occurrence. CONTRACTOR shall also be responsible to assist COMPANY in accident investigation if so required. COMPANY may call for a joint investigation with CONTRACTOR if necessary.

CONTRACTOR shall where applicable have, prior to commencement of Contract, accident reporting and investigation procedures and shall maintain accident statistics which shall be compatible with COMPANY Accident Reporting Procedures. Otherwise, CONTRACTOR shall adopt the current COMPANY Accident Reporting Procedures.

CONTRACTOR shall submit the basic safety information to the appropriate COMPANY Representative not later than the first day of the month following the month under review, by email/telex or fax.

12.11 ALCOHOL / DRUG POLICY

- ▶ CONTRACTOR personnel, agents and Subcontractors shall not misuse legitimate drugs or possess, use, distribute, or sell illicit or prescribed controlled substances or drug on COMPANY business or premises. CONTRACTOR shall adopt and enforce work rules and policies in order to assure compliance with this obligation.
- ▶ CONTRACTOR is reminded that alcohol and illegal drug are totally prohibited from Worksite.
- ▶ COMPANY also reserves the right to conduct searches on possession of drug and/or alcohol to the person, vehicles, and other property of CONTRACTOR, its personnel, agents or Subcontractors while on premises owned or controlled by COMPANY. Any person who refuses to cooperate with any such search shall be removed from the premises and not permitted to return.
- ▶ CONTRACTOR shall require its personnel, agents and Subcontractor to submit to medical evaluation on alcohol or drug testing where cause exists to suspect alcohol or drug use.
- ▶ CONTRACTOR warrants that any of its personnel, agent or subcontractor who either (a) refuses to participate in medical evaluation or alcohol or drug tests, or (b) tests positive for alcohol or controlled substance, shall be removed from the premises and not be permitted to perform any work with COMPANY.
- ▶ CONTRACTOR shall maintain strict discipline and good order among its personnel, agents and subcontractors, and shall not permit any of them to engage

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in activities which COMPANY deems contrary or detrimental to COMPANY interests. If COMPANY requests that any personnel of CONTRACTOR or of subcontractors be removed from COMPANY property or Work site pursuant to this Contract for any reason, CONTRACTOR shall accede to such request and shall provide a replacement acceptable to COMPANY at no additional cost to COMPANY.

- ▶ In the event CONTRACTOR is unable to comply with these obligations, COMPANY shall have the right to terminate this Contract.

12.12 MEDICAL WELFARE

CONTRACTOR shall ensure that all its personnel and/or other personnel assigned by CONTRACTOR for the performance of the Works are medically fit and healthy. Any medical disabilities including such disabilities which CONTRACTOR may consider will not adversely influence the person's ability to perform his role in the Works should be reported to COMPANY prior to the start of the Works. CONTRACTOR, if requested by COMPANY, shall provide medical certificates for CONTRACTOR and Subcontractor personnel.

CONTRACTOR shall subject its key personnel and its Subcontractor personnel to regular medical examination at their cost. Records of such examination shall be made available to COMPANY on request.



CONTRACTOR shall at no cost to COMPANY be responsible for the medical welfare of its own and Subcontractor personnel and shall take care of arrangements for medical attendance treatment or hospitalization if and when necessary and will arrange suitable insurance coverage for such contingencies. In cases of emergency, COMPANY may make or provide for, the necessary emergency arrangements, the costs of which shall be reimbursed to COMPANY by CONTRACTOR.

CONTRACTOR shall make first aid arrangements for all of its personnel and ensure that all personnel are informed of such arrangements.

Where applicable, CONTRACTOR shall provide a suitably equipped and staffed first aid room if the Work Site presents a high risk from hazards.

12.13 ENVIRONMENTAL

The CONTRACTOR's Site Specific Environmental plan requirements shall identify and demonstrate how the CONTRACTOR plans to eliminate or mitigate the potential environmental risks associated with the project while ensuring compliance to the minimum Site Specific requirements.



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In addition to this, the CONTRACTOR shall comply with all local and Pakistani national laws, ordinances and regulations pertaining to environmental protection including, but not limited to, the following:

- ▶ Natural resources including air, water and land
- ▶ Solid waste disposal including excess excavated material
- ▶ Noise including explosions
- ▶ Control of dust, toxic substances, hazardous materials and radiation
- ▶ The presence of chemical, fuel and lubricants, physical and biological elements and agents that adversely affect and alter ecological balances
- ▶ Degradation of the aesthetic use of the environment
- ▶ Impact on daily activities such as traffic
- ▶ Historical, archaeological, and cultural resources the plan should cover
- ▶ Waste Management Program

12.14 REPORT

CONTRACTOR shall be responsible to document its performance in HSE for the duration of the contract and submit to COMPANY at the end of contract or when requested by COMPANY.

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13 SECURITY / COMMUNITY RELATIONS

13.1 GENERAL

The objectives of security measures for the purposes of this Contract could be defined as “taking such sufficient, reasonable and effective steps and measures that would secure and safeguard men, materials and equipment so that they are free to deliver their normal output without any delay, hindrance or stoppage on this account”.

It is CONTRACTOR’s obligation to ensure the comprehensive security of its personnel, equipment and materials both during transportation and at work site during the execution of the Project till the issuance of the Provisional Acceptance Certificate (PAC). Though the CONTRACTOR shall be responsible for security of its personnel, CONTRACTOR’s and COMPANY’s Items at all times. COMPANY shall be responsible for the security of the new facilities provided under this Contract only after the issuance of Provisional Acceptance Certificate (PAC)

COMPANY shall be responsible for the security of its own personnel.

CONTRACTOR shall prepare and maintain accurate reports of any incident(s) of loss, theft or vandalism and shall furnish such reports to COMPANY as part of the agreed reporting procedure for the works. Incidents shall be reported, follow-up and closed through COMPANY’s incident management system.

13.2 CONTRACTOR’S RESPONSIBILITIES



CONTRACTOR shall be responsible for the care, custody, pilferage, construction damage and weather effects for the Works. This includes responsibility of escorting and/or protective cover to and from the Site of CONTRACTOR construction crews, personnel, equipment and materials.

Locations, where CONTRACTOR shares common entrance through COMPANY’s premises for access to his work-place, the CONTRACTOR will be responsible to ensure that CONTRACTOR’s employees, labor and vehicles move directly to the work-place and DO NOT trespass COMPANY’s restricted areas.

The CONTRACTOR shall ensure the security of the temporary facilities outside the confines of Maru-I wellhead as well as the security of the work-place area.

CONTRACTOR when making the security arrangements shall comply with COMPANY’s security requirements (security personnel, weapons, vehicles, posts, catering, camp etc.).

The CONTRACTOR shall be responsible for providing food, accommodation, fuel, etc. for their own security related personnel, equipment and vehicles.

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The CONTRACTOR shall be responsible for dealing with and resolving all disputes directly or indirectly connected with their employees, and that arising out of employment of its personnel.

The CONTRACTOR shall be responsible for handling day to day issues/ complaints which are attributable to the CONTRACTOR and its personnel.

CONTRACTOR shall, during the continuation of this Contract, work in close liaison with COMPANY's Security Department for the sharing of information on security matters and issues. Furthermore, CONTRACTOR shall ensure alertness of its security staff during the performance of Work.

CONTRACTOR shall whenever possible employ the Security Staff from the local areas (except from the villages from immediate vicinity) subject to availability and suitability of qualifications, experience and physical/ medical fitness for the work with satisfactory record of conduct.

CONTRACTOR shall be responsible to seek security clearance of all its security personnel from relevant authorities. Copy of the same will be forwarded to the COMPANY's Security.

CONTRACTOR shall ensure that its security staff is equipped with weapons of good quality, purchased under legal permit from a legal outlet and has a permission to carry such weapon. Where required, the security guards shall be armed with 12 bore pump action repeater shot guns/ pistols of a reputable make (or as mutually agreed between the COMPANY and CONTRACTOR) with sufficient ammunition. CONTRACTOR shall also ensure the safe custody and safety of their weapons, ammunition and equipment.

CONTRACTOR shall be responsible to set up communication links between:



- Work locations and CONTRACTOR's Base Camp
- Escorting crew and the CONTRACTOR's Base Camp (during escorting of personnel, equipment and materials.)

CONTRACTOR shall develop comprehensive entry and exit operation in line with COMPANY policies, procedures and guidelines for all the Site gates for personnel, vehicles, equipment and material and shall ensure its implementation at all time.

CONTRACTOR shall ensure the discipline and compliance of COMPANY's HSE policy by CONTRACTOR's Security Staff.

CONTRACTOR shall duly notify COMPANY's representative in writing if work is going to be, or has been suspended due to security reasons.

The CONTRACTOR hereby guarantees that the CONTRACTOR and the workmen / Subcontractors/ personnel employed by him in connection with the execution of this CONTRACT shall maintain industrial peace while on the job inside the COMPANY'S premises during the entire period of the CONTRACT and any administrative,

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disciplinary or any other dispute arising between the CONTRACTOR and his employees or any dispute amongst the workmen / employees interest shall be settled outside the COMPANY'S premises without affecting the work schedule set forth by the COMPANY. The CONTRACTOR, at his sole risk, shall resolve all administrative problems with locals of the area or their representative for smooth WORKS execution

13.3 COMPANY'S RESPONSIBILITIES

COMPANY shall be responsible for the security of its personnel, existing facilities and equipment installed/deployed at the Work Site.

COMPANY's Security Staff shall guard the premises of the Maru-1 wellhead, which are confined facilities with perimeter fence and boundary wall.

COMPANY shall notify CONTRACTOR, as soon as it is reasonably practical, after the discovery of any incident or circumstances regarding the Work where, in the opinion of the COMPANY, immediate action is required to effect emergency, remedial, or other operations for security reasons.

COMPANY shall handle directly all matters and issues (not attributed to the CONTRACTOR) with the related local community, land owners, local / district / provincial administration, notables, police etc.



COMPANY shall provide relevant experts from security policies, plan, general rules and emergency response procedure to the CONTRACTOR in the form of Security briefing by the FSI for their general guidance and compliance. Based on these guidelines and policies, CONTRACTOR shall develop its own procedures for the effective implementation of the security policies and the plans. Copy of the same will be shared with the COMPANY's Security.

13.4 SECURITY INCIDENT / EVENT INVESTIGATION AND REPORTING

Any Project related security event/ incident occurring during the execution of this Project till the issuance of PAC involving CONTRACTOR and/or the COMPANY shall be reported and investigated

This investigation shall establish the root cause underneath the immediate or apparent cause of any security incident / event. The investigation will establish the responsible party or parties for the event/ incident based on the root cause. Responsibility of bearing the cost and/ or schedule impacts and/or taking counter measures for recurring of any security event shall only be determined by the root cause analysis.

CONTRACTOR shall ensure that all Incidents are reported immediately to the COMPANY's Security with Initial Investigation Report within 24 hours of its detection/happening/occurrence. The Parties shall investigate the matter and each complaint and event shall be addressed accordingly and remedied as soon as possible.

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13.5 COMMUNITY RELATIONS

CONTRACTOR shall endeavor to employ local people, especially from the vicinity of the Site, in order to nurture the relationship with local communities as much as their qualifications and skills make it possible to do so. All such dealings must be carried out in consultation with the COMPANY. If CONTRACTOR withholds payments to such local persons or subcontractors unreasonably, then COMPANY shall have the right to make those payments directly with subsequent deductions from the invoice(s) payable to the CONTRACTOR.

CONTRACTOR shall at its own expense provide and maintain such accommodation and amenities as it may consider necessary for all its staff and labor, employed for the purposes of or in connection with the Contract.

CONTRACTOR shall engage a professional labor CONTRACTOR if appropriate, in consultation with COMPANY, to handle hiring of locals using proper paperwork as per the legal requirements under the Laws of Pakistan, and to terminate their services upon completion of the Project. COMPANY shall have no liability with respect to any labor issues at Site.

CONTRACTOR shall be responsible to handle all local community issues arising as a result of CONTRACTOR's activities and/or for reasons attributable to CONTRACTOR. Though in case deemed necessary, on CONTRACTOR's request, COMPANY may intervene to facilitate the CONTRACTOR in resolving any local community dispute/issue (attributable to CONTRACTOR), however, in any such case COMPANY will hold no liability/responsibility of getting the matter settled and/or bear the consequences.

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14 QUALITY ASSURANCE AND QUALITY CONTROL

14.1 GENERAL

CONTRACTOR shall be responsible to plan, establish, implement and maintain a Quality System for the engineering, procurement, fabrication, installation, pre-commissioning and commissioning support as per the Contract in line with ISO 9001, ISO 9002 and the requirements of project specification for Quality Assurance.

CONTRACTOR shall submit a copy of CONTRACTOR's policy statement on their corporate quality manual and procedures, as a part of their bid, for review by COMPANY.

CONTRACTOR shall be responsible for all Quality Assurance and Quality Control functions and shall at all times provide adequate, competent and qualified supervision and inspection personnel, approved by COMPANY, to ensure that the quality of work is met and timely inspected.

CONTRACTOR shall supply all the relevant quality assurance requirements to its Subcontractors, suppliers etc. involved in the Project for compliance and shall be responsible for Overall Project Quality Assurance and Quality Control.

14.2 PROJECT QUALITY PLAN



CONTRACTOR shall prepare a specific Project Quality Plan for the Contract, detailing all quality aspects as defined in COMPANY specification mentioned above and submits to COMPANY for approval, within 2 weeks' from the Contract Effective Date. The Quality Plan shall cover, in addition to compliance with related project specifications, all aspects of on and off site inspections, inspection request forms, non-conformance reports, remedial actions, records, scheduling, etc.

CONTRACTOR shall effectively implement the quality system defined in the plan, verify execution of the implemented system and issue reports of audits performed. Any non-conformance will be handled in line with the requirements of the Quality Plan. Any deviations / non-conformance that require COMPANY approval will be submitted to COMPANY with adequate back-ups justifying the acceptability of the deviations / non-conformance. CONTRACTOR shall be responsible to extend these requirements to its subcontractors and suppliers.

14.3 QUALITY CONTROL

Quality control activities for the Project shall include the following, as a minimum:

- ▶ Development of inspection and test plans (ITPs), procedures, schedules and reports for Construction;
- ▶ Review, approval and monitoring of vendor / Subcontractors inspection and & test

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- plans;
- ▶ QA/QC requirements for Subcontractors / vendors;
 - ▶ QA/QC requirements for all site related activities (Field QA/QC plan);
 - ▶ Document Control;
 - ▶ Safety & Environmental control;
 - ▶ Verification of all test certificates for compliance with COMPANY requirements. To achieve the above objectives, dedicated QC Personnel are required for the Works.

14.4 INSPECTIONS AND TESTING

CONTRACTOR shall arrange, co-ordinate and be responsible for all inspections and testing, including code inspection covering all shop and site related items. CONTRACTOR shall provide all necessary testing equipment, materials, tools, supervision and manpower for carrying out proper testing of all facilities.

CONTRACTOR shall be responsible for safe and proper inspection and testing of items and facilities.

Request for Inspection (RFI) for site inspection shall be submitted at least 24 hours prior to the inspection activity.

CONTRACTOR shall provide facilities for the inspection of weld, in accordance with the project specification. The cost of all such facilities, materials and resources, shall be included by the bidder in the Contract Price.



Representatives from COMPANY and CONTRACTOR shall perform the inspections together on all materials, equipment and works for compliance with the project specifications.

All Material Receiving Inspection (MRI) shall include original or certified copy of Mill Certificates and Vendor Drawings.

14.5 QUALITY ASSURANCE MANUAL

The contents of CONTRACTOR's Quality Assurance Manual shall cover:

- ▶ Pipeline laying;
- ▶ Piping Fabrication /Manifolds;
- ▶ Valves, Check valves, Safety valves;
- ▶ Vessels or equipment installation;
- ▶ Pipes and fittings;
- ▶ Skid mounted equipment;
- ▶ Handling and lifting equipment.

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14.6 QUALITY MANAGEMENT SYSTEM REQUIREMENTS

CONTRACTOR shall ensure a Quality Management System (“QMS”) is implemented on the Project for all aspects of the Work in order to ensure that the Facilities shall conform to the Technical Requirements, regulatory requirements, sound and generally accepted engineering and construction practices and all other QMS related requirements set forth in Contract.

CONTRACTOR’s QMS duties extend to all members of CONTRACTOR’s Group, and CONTRACTOR is responsible for its Subcontractors’, Vendors’ and their subcontractors’ and sub-suppliers’ fulfillment of the QMS responsibilities.

COMPANY maintains the right to review and approve all QMS related documentation, witness testing of Materials and components of the Facilities, and to inspect the Facilities.

Such review of documents and/or inspection and witness of testing by COMPANY shall in no way relieve CONTRACTOR from its obligation to full fill its QMS duties and for the Facilities to comply with the Technical Requirements, unless deviations are specifically agreed upon in writing by COMPANY.

CONTRACTOR’s quality system shall include the following features and provisions:

▶ **Scope**

CONTRACTOR’s quality system shall encompass all phases of the Work and shall apply to materials and facilities comparable to the Materials and Facilities;

CONTRACTOR’s quality system shall be consistent with ISO 9001:2000.

▶ **Audit Provisions**



CONTRACTOR’s quality system shall include an internal and external audit program to demonstrate proactive compliance throughout all phases of the Work and as applied to all Materials, components of the Facilities, and the completed Facilities.

▶ **Reporting**

CONTRACTOR shall submit copies of all audit, test and inspection reports within two (2) weeks of the event for COMPANY’s review.

▶ **Reporting and Resolution of Non-conformities**

CONTRACTOR’s quality system shall establish procedures to ensure that all of CONTRACTOR’s Suppliers’/Subcontractors’ procedures for reporting and resolution of nonconformance items are aligned and integrated with CONTRACTOR’s nonconformance resolution process. These procedures shall include the necessary CONTRACTOR engineering review and disposition processes and COMPANY review and Approval requirements.



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14.7 CONTRACTOR'S QMS PLAN

The CONTRACTOR's QMS Plan shall describe the QMS activities to be implemented by CONTRACTOR and all other members of CONTRACTOR Group, and shall cover the full scope of the Work (e.g., engineering, procurement, construction, start-up and commissioning support). The QMS Plan shall include but not be limited to the following

- ▶ Organization chart(s) that illustrate the reporting relationship of the QMS personnel with other Work personnel for all CONTRACTOR Group home office and field organizations
- ▶ A matrix that shows the proposed inspectors/inspection companies, location of quality surveillance personnel, their qualified discipline(s), years of supplier surveillance experience, and employment status (i.e., full-time or part-time employee and subcontracted or CONTRACTOR employee)
- ▶ A list of QMS procedures that will be used during the Work with a description of the scope and purpose of each procedure
- ▶ The plan for reviewing Contract and subcontract documents regarding Supplier/Subcontractor quality control requirements
- ▶ The plan for performing surveillance at a Supplier's/Subcontractor's (or their sub-supplier's) facility to inspect Material and components of the Facilities to ensure conformance to the Technical Requirements
- ▶ The plan for applying shop inspection resources to Materials and bulk Materials
- ▶ The plan for performing evaluations/audits of Suppliers'/Subcontractors' quality systems to determine Supplier/Subcontractor capabilities and compliance
- ▶ The plan for issuing surveillance or evaluation reports in a timely manner
- ▶ The plan for performing Supplier/Subcontractor surveys
- ▶ The plan for conducting Supplier/Subcontractor Quality Alignment Meetings at a Supplier's/Subcontractor's facility when requested
- ▶ Identification and traceability systems for Materials
- ▶ Equipment and Material handling and storage procedures
- ▶ Non-conformance reports and Corrective action procedures
- ▶ Non-conformance reports will be issued when Work presented by the Supplier as being complete is found to be deficient. Corrective action procedures will be developed, corrective actions will be carried out and corrective action reports written and submitted to COMPANY for review.
- ▶ Record-keeping methods and systems

CONTRACTOR shall include written management level reporting pertaining to all QMS activities in all progress reports that summarizes the results and identifies any key issues pertaining to QMS activities for the Work.

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14.7.1 Material Traceability Requirements

CONTRACTOR shall ensure that Material certification documentation, suitable for ensuring clear Material traceability, is provided for all aspects of the Work in accordance with the Technical Requirements. CONTRACTOR shall submit its Material Traceability and PMI Program, and Procedures for COMPANY approval, and such procedures shall be a part of CONTRACTOR's QMS Plan.



14.7.2 Qualification of CONTRACTOR Inspectors

CONTRACTOR shall select experienced inspectors/inspection companies who have in-depth knowledge of the equipment, specifications, inspection techniques certified by the code for the specific task, and trades involved in fabricating/constructing/erecting/installing the specific Work and/or equipment they are assigned to inspect. Each inspector and inspection COMPANY to be used by CONTRACTOR shall be identified before Work starts. Prior to starting Work, the CONTRACTOR shall submit to COMPANY the name and career resume of each inspector proposed. COMPANY reserves the right to reject CONTRACTOR inspectors/inspection companies before Work starts or during the course of the Work. COMPANY shall have the right to interview all Contractors' proposed inspectors/inspection companies prior to the start of Work.

CONTRACTOR inspectors/inspection companies approved by COMPANY shall not be changed unless COMPANY approves such changes in writing.

CONTRACTOR shall have a full-time QMS Manager to assign and administer inspection on the Work. The QMS Manager's responsibilities shall include supervision of inspectors, maintaining QMS plan, performing audits to ensure compliance with QMS plan, review of all inspection reports prior to distribution and providing COMPANY sufficient notice of test/inspection points. CONTRACTOR's QMS Manager shall maintain a database of Work and equipment to be inspected showing as a minimum, the purchase order number, Supplier, factory location, equipment number and description, contact with phone number, name of CONTRACTOR inspector, preproduction meeting date, production start date, required shipping date, scheduled shipping date, size/weight, whether Supplier/Subcontractor is ISO 9000:2001 certified, and a space for remarks. CONTRACTOR shall update the database weekly and provide two (2) copies to COMPANY. The frequency may change to monthly updates when directed by the COMPANY.

COMPANY reserves the right to communicate with CONTRACTOR's inspector(s) directly and make joint or separate visits for inspection, witnessing tests and evaluating the CONTRACTOR inspector's performance. CONTRACTOR's inspector(s) shall speak and write fluently in the English language.

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14.7.3 Qualification Inspection and Surveillance Levels (Qi)

The project Quality Surveillance and Inspection coordinator should work closely with Engineering to establish the level of QS&I required for each purchase order or contract which is based on product complexity, characteristics, type of service, manufacturing complexity and schedule.

There will be five levels of QS&I from level 0 which will have no source of quality surveillance or inspection, graduating up to level 4 with continuous QS&I, where the resident QS&I Inspector is required at the manufacturing facilities.



14.8 INSPECTION AND TEST PLANS (ITPS)

CONTRACTOR shall develop and implement Inspection Test Plans (ITPs) for all aspects of the Work (e.g., procurement, fabrication, installation, construction, start-up and commissioning support). All ITPs shall be consistent with Contract Schedule and be submitted to COMPANY for Approval. The ITPs shall list and describe all inspection, test, and Material certification requirements necessary to ensure that Technical Requirements, Project Specifications and CONTRACTOR's quality standards are met. As a minimum, the ITPs shall include the following:

- ▶ Identification of the scope of Work covered by the surveillance function
- ▶ A tabular format listing of all inspection and test items
- ▶ All required inspection and test points and location of the Work
- ▶ All required inspection and test points by applicable certifying authorities such as ASME (as applicable) according to applicable regulatory guides, rules, codes and specifications
- ▶ Applicable document references and acceptance criteria for the type of inspection and test required for all phases of the Work. Reference to applicable control documents such as instructions, procedures, drawings, specifications, inspections and test plans, inspection, and test records to be used to execute the inspection and test activities
- ▶ Inspection points shall be provided to satisfy the inspection and testing requirements of the relevant code and specification
- ▶ Inspection and test certification documentation
- ▶ Identification of all COMPANY designated witness and hold points.

CONTRACTOR is expected to review and expand the Technical Requirements as necessary to meet the quality objectives of the Work, but under no circumstances may the CONTRACTOR reduce the Technical Requirements.

CONTRACTOR shall be ultimately responsible for the development and proper implementation of all ITPs, including those reviewed or developed by CONTRACTOR's Suppliers/Subcontractors. All the ITPS shall be submitted for

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COMPANY review and approval prior to fabrication of equipment and all on-site fabrication/ installation/ erection/ construction activities.



COMPANY reserves the right to select witness and hold points within all developed ITPs for COMPANY's oversight of selected functions and to perform surveillance or audits of the Work.

14.9 COMPANY QUALITY MANAGEMENT ACTIVITIES

COMPANY may inspect and shall have free access at all times to any part of CONTRACTOR's Supplier's/Sub-CONTRACTOR's facilities associated with the Work under this Contract. COMPANY reserves the right to participate in any audits scheduled by Supplier/Subcontractor or to plan and conduct its own audits including Supplier/Subcontractor facilities. COMPANY shall have the option of inspecting every item and procedure associated with the Work. Work shall not proceed beyond COMPANY inspection "witness" or "hold" points without COMPANY inspection or COMPANY written waiver of inspection. COMPANY inspectors shall have the right to explore any apparent defects in Materials, welds or fabrication. Supplier/Subcontractor shall provide office space, drawings, phone and other support Materials for COMPANY inspection personnel during execution of the Work. In addition to inspection points indicated on the ITPs, COMPANY may, at its sole option, inspect any activity related to facilities/work under this Contract at any time. Supplier/Subcontractor shall fully support COMPANY in this activity on an accompanied or unaccompanied basis as required by COMPANY.

Methods of COMPANY inspection may include, but are not limited to: visual, metallurgical, dimensional, or any suitable non-destructive testing method. The type and extent of inspection shall be at the discretion of COMPANY. For performance or mechanical tests, CONTRACTOR shall provide pre-witness test data at the time of final confirmation/notification of the test date.

Where COMPANY inspectors have just cause to suspect the quality of any item/activity, the inspector may require that additional inspection or testing be performed either by CONTRACTOR or by a third party selected by COMPANY. Prior to this additional inspection or testing, the inspector will so advise COMPANY or designated representative of the situation. Cost for inspection and testing and repairs of defects shall be the responsibility of CONTRACTOR. For any COMPANY identified defects not corrected in a timely manner by CONTRACTOR's Supplier/Subcontractor, CONTRACTOR shall provide a Non-conformance Report which provides the reason for non-conformance and corrective actions to be taken. Based on applicable codes, standards and specifications, COMPANY shall be the sole judge of the acceptability of such non-conforming conditions and corrections, and COMPANY decisions shall be final.

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CONTRACTOR shall ensure that all engineering and inspection documentation is readily available to COMPANY inspectors at Supplier's/Subcontractor's facility at all times. COMPANY shall have complete access to all documentation.

14.10 CONSTRUCTION QUALITY SURVEILLANCE PLAN

CONTRACTOR shall develop and implement a Construction Quality Surveillance Plan to monitor the fabrication, assembly, construction, erection, lead-out, transport, installation, and Start-up and Commissioning portions of the Work. This Plan shall be submitted to COMPANY for review and approval not later than sixty (60) days prior to the start of Work at each Work Site.



The construction quality surveillance plan shall include an organization chart showing the organization responsible for implementing construction quality surveillance and the relationship with other members of CONTRACTOR's construction organization.

Separate ITPs for each Work Site shall be prepared discipline-wise for each work activity. The construction quality surveillance plan shall reference and be supported by written procedures for controlling the issuance of and changes to the plan, reporting and resolving non-conformities detected and management of records associated with implementation of the plan.

The construction quality surveillance plan shall provide a description of the surveillance report format and include sufficient detail to trace the surveillance function/attribute contained in the construction quality surveillance plan to the identity of the item checked during the surveillance.

Surveillance reports shall be submitted to COMPANY weekly during construction unless otherwise specified in the Contract.

CONTRACTOR shall provide a resident QMS Team at all Work sites during fabrication, assembly, construction, erection, installation, and Start-up and Commissioning phases of the Work. The inspection team shall contain qualified welding, piping, painting, and other discipline inspectors as required to ensure compliance with the Technical Requirements and permit Work to proceed in accordance with planned schedule.

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15 CERTIFICATE OF COMPLETION



CONTRACTOR shall apply to the COMPANY for the Certificate of Completion when CONTRACTOR considers that all scope of work has been successfully completed, all punch-list items closed & signed off by COMPANY and all as built drawings, documents are submitted to the COMPANY. On receipt of CONTRACTOR's application, COMPANY shall either issue a Certificate of completion or notify CONTRACTOR in writing within fourteen (14) days of any Defects in the Works undertaken by the CONTRACTOR under this Contract.

15.1 RECONCILIATION OF MATERIAL

COMPANY/CONTRACTOR Supplied material, any surplus or scrap material remaining after the execution of work shall be reconciled and handed over to the COMPANY's Representative. The CONTRACTOR shall keep track of all materials received, materials supplied, materials utilized and surplus materials progressively so that a comprehensive Material Reconciliation Report (MRR) is developed and maintained. At the completion of project, the CONTRACTOR shall submit a final MRR to the COMPANY's Representative for review & approval. The CONTRACTOR will not be issued Completion Certificate (CC) unless he attaches a MRR duly approved by the COMPANY with his request for MCC.



Any surplus / left over material as a result of material reconciliation at the end of the project, shall be COMPANY property and to be handed over to COMPANY. CONTRACTOR shall ensure that:

- All the left over / surplus as mentioned in the CONTRACTOR reconciliation report & approved by COMPANY shall be completely handed over to COMPANY. If the CONTRACTOR fails to return all the Surplus / left over material as mentioned in the approved reconciliation report, then the amount of any missing or shortage surplus / left over material shall be deducted from CONTRACTOR's invoices based on the CONTRACTUAL unit rates.
- If the surplus / left over material (bulk) are handed over to COMPANY in damaged / deteriorated condition, then the cost of such items shall also be

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deducted from the CONTRACTOR's invoices based on the CONTRACTUAL unit rates.

- Installation / Erection (service part) shall be compensated on unit rates based on the actually installed quantities, which shall be reconciled with As-built drawings after Mechanical Completion. As a result of reconciliation, if any additional quantities are found that have been paid to CONTRACTOR through running invoices then same shall be recovered in the next invoices.

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16 MANAGEMENT, PROJECT CONTROL AND ADMINISTRATION



16.1 EXECUTION PLAN & MANAGEMENT

CONTRACTOR shall carry out all activities according to a pre-approved project execution plan (PEP). CONTRACTOR shall prepare and submit, for COMPANY's approval, procedures for all works. The Project Execution Plan (PEP) should highlight the project procedures, project organization and implementation strategies in sufficient details for a seamless and timely execution of the project. The PEP should at the minimum include but not be limited to the following procedures:

- Execution Strategy (High Level)
- Organization/Roles and Responsibilities
- Staffing Plan
- Project Schedule (Master)
- Mobilization and Resourcing
- Administration and Communication
- Information Management
- Health, Safety & Environment
- Risk Management
- Quality Management
- Project Controls including Scheduling, Updating and Monitoring, Reporting, Change Management, and Cash Flow etc.
- Procurement Plan including but not limited to materials, equipment, sub-Contractor's work, preservation and storage etc.
- Construction Plan & Procedures
- Mechanical Completion & Pre-commissioning Plan
- Security plan.

16.2 PROJECT SCHEDULING, PLANNING & MONITORING

CONTRACTOR shall develop a detailed level III / IV (as directed by COMPANY) schedule including procurement, construction & mechanical completion activities. Detailed schedule, along with resources histograms & S-Curves, shall be submitted by CONTRACTOR within 2 weeks' time after issuance of Letter of Award (LOA), for COMPANY's review and approval. The schedules shall be prepared in a structured way

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showing individual elements including the details of critical path activities. Each element shall be able to be definitively progressed and be rolled up to multiple levels of control.

In addition to the bar charts and precedence network analysis, the following ‘S’ curves and histograms will be submitted:

- Weighted progress curve for engineering;
- Construction progress ‘S’ curve.
- Overall Project-weighted progress curve;
- Manpower histograms for construction (by discipline for indirect and by trade for direct, i.e. welder, fitter, painter, etc.)

The progress curves and histograms will indicate the planned cumulative percentage progress and the actual cumulative percentage progress. Manpower histograms shall be categorized by resource trade grouping or phase of work.

All work shall be carried out by CONTRACTOR under the supervision of experienced personnel in accordance with COMPANY approved procedures, and the best and latest approved practices of the oil and gas industry.

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17 PROJECT DOCUMENTATION

Project documentation requirements for Contract execution, as explained below, shall be compiled by the CONTRACTOR.

17.1 PROCUREMENT AND CONSTRUCTION PHASE

The documents and drawings, which are to be submitted to COMPANY, for review and approval, shall be proposed by CONTRACTOR and approved by COMPANY as a part of approval of Technical Document Register (TDR), during early part of project. The balance documentation in TDR shall be forwarded to COMPANY, for information. CONTRACTOR shall submit all documents/deliverables in native format and PDF Format, for COMPANY review, comment & approval and/or information.

17.2 FINAL DOCUMENTATION



After successful completion of provisional acceptance, CONTRACTOR shall hand-over the Final project Documentation to COMPANY as outlined below:

- ▶ The number of sets of Final Documentation to be handed over, shall be:

- ✓ Hard Copy - 2 Sets
- ✓ Electronic Copy - 2 Sets

Hard copies shall be handed over as properly hard-cover bound volumes, with complete documentation index in each volume, in addition to the index of the respective volume. Proposal for hard-cover bound shall be submitted and agreed by COMPANY.

- ▶ Electronic copies shall be on CD with proper labels and List of Contents.
- ▶ The Final Project Documentation, shall include, but not limited to, the following:
 - Final Documentation, As Built Documents and Drawings;
 - Construction Documentation and Records;
 - QA/QC Dossiers of all field and shop fabricated items;
 - Manufacturing records;
 - The complete Final Documentation shall be submitted by CONTRACTOR to COMPANY within one (1) months from issuance of Acceptance Certificate.

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18 PROJECT CLOSE OUT

Within six (6) weeks from the Provisional Acceptance date of the complete Work, CONTRACTOR shall prepare a closeout report, for submission to COMPANY. The report shall contain a detailed narrative of all main events, major decisions undertaken, problems faced and their resolutions for technical aspects, lesson learnt, project management, procurement, installation, testing, commissioning, and interfacing.

Project close out report will include an updated project schedule, s-curves, histograms, and material tracking record showing scheduled versus actual data. It will also include the Record of Final Documentation hand-over and Demobilization.

CONTRACTOR shall be responsible to attach following documents, but not limited to, with the Project Close Out Report:

- Piping test Packs and system packs
- Complete final dossier including final as-built drawings
- Dossiers of all Construction work.
- Dossiers of all manufacturing works that is included in CONTRACTOR's scope.
- All material testing certificates (including pipes, fittings, flanges, valves, structure etc.)
- Reports of All welding procedures along with welder records.
- All procedure qualification records.
- Complete weld control summary.
- All ultrasonic test reports.
- All QA/QC reports of but not limited to megger tests, cube tests, loop tests, etc.
- Documentation / Calibration records of all instrumentation.
- Reports of all MPT / DPT tests carried out during the course of the Project
- All red line prints identifying the modifications undertaken during Construction works
- Project Close-out Schedule (containing comparison of planned and actual dates)
- System-wise completion certificates.
- Material Audit Reports & Reconciliation Report.
- Management of Change (MOC) documentation including decision log, nonconformance reports (NPR) log, change log etc.

ANNEXURE-A (CONSTRUCTION SPECIFICATIONS)

APPENDIX-A1



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
FABRICATION, INSTALLATION & TESTING OF PIPING
DOC. NO: 0504196-MEC-SP-001

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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Disclaimer

This Specification has been prepared on behalf of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and for the exclusive use of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and is subject to and issued in accordance with the agreement between Petrochemical Engineering Consultants (PEC) and OGDCL. PEC accept no liability or responsibility whatsoever for it in respect of any use of or reliance upon this Specification by any third party.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	AV	SAR	Adeel	Jan 19 th , 2021		

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1. GENERAL

1.1 Scope

This Specification together with the referenced codes and standards define the minimum requirements for fabrication, installation and testing of shop and field fabricated piping. The Specification is based on pressure process piping and utility piping as defined by ASME B31.3.

This specification shall be read in conjunction with associated project isometric drawings, piping and instrument drawings, special piping items list and other associated specifications.

1.2 Definitions

The following words are used throughout this document and have specific meanings as follows:

COMPANY:	OIL & GAS DEVELOPMENT COMPANY LIMITED (OGDCL)
CONTRACTOR:	The person or persons, firm or Proprietor, whose proposal, has been accepted by the COMPANY for construction, installation / erection, testing and completion of all works as mentioned in the SOW
Examiner:	Person authorized by the Contractor to perform quality control examinations.
Inspector:	Person authorized by the CONTRACTOR and/or COMPANY to verify that all required examinations and testing have been completed and are in compliance with Project requirements in the light of Company Specifications and Guidelines.

1.3 Abbreviations

GTAW:	Gas Tungsten Arc Welding
SMAW:	Shielded Metal Arc Welding
SAW:	Submerged Arc Welding
PWHT:	Post Weld Heat Treatment
WPQR:	Welding Procedure Qualification Records
WPR:	Welding Procedure Register
WPS:	Welding Procedure Specification

1.4 Errors or Omissions

The review and comment by the Company of any Contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Company.

1.5 Deviations

All deviations to this Specification, other related specifications or attachments shall be brought to the knowledge of the COMPANY in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection of the WORKS shall be with written approval of the COMPANY prior to execution of work. Such deviations shall be shown in the documentation prepared by the CONTRACTOR.

1.6 Conflicting Requirements

In the event of any conflict, inconsistency or ambiguity between the Contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the CONTRACTOR shall refer to the COMPANY whose decision shall prevail.

2. Reference Specifications

The following codes and standards shall apply. Latest editions shall be used including addenda, supplements or revisions.

2.1 Statutory Requirements

Statutory requirements required by the Company or by Pakistan legislation apply.

2.2 Specifications

All Standard and Projects Specifications

2.3 International Standards

ASME B1.20.1:	Pipe Threads
ASME B31.3:	Process Piping
ASME Section VIII:	Boiler and Pressure Vessel Code
Section II	Materials Specifications
Section IX	Welding and Brazing Qualifications
Section V	Non Destructive Examination
ISO 5167:	Measurement of Fluid Flow by means of orifice plates, nozzles and venturi Tubes inserted in circular cross section conduits running full.
EN 287:	Approval Testing of Welders for Fusion Welding
EN 288:	Specification for Approval of Welding Procedures for Metallic Materials.
EN 462-1:	Image quality of radiographs: Pt 1 - Image Quality Indicators (Wire Type).....Determination of Image Quality Values.
BS EN 10204:	Metallic Products - Types of Inspection Documents
NACE MR-01-75:	Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment.

3. Technical Requirements

3.1 Materials

3.1.1 General

Materials found to be damaged or to have defects shall not be used in fabrication unless repaired in accordance with a repair procedure approved by the COMPANY.

Materials furnished free issue by the COMPANY will be supplied with the appropriate mill certificate and approvals. If not supplied, the material shall be quarantined and the COMPANY notified for resolution.

All items furnished by the CONTRACTOR shall be supplied in accordance with the appropriate Company specifications and shall be new, sound, free from defects and supplied with the appropriate

certificates and approvals. For items not covered by a specification, certification shall be supplied in accordance with BS EN 10204 certificate type 3.1B unless otherwise agreed.

Temporary bracing, erection aids, scaffolding, temporary testing materials and equipment shall be furnished by the CONTRACTOR in a safe and serviceable condition, and in compliance with all Pakistan Health and Safety legislation, and International Health and Safety Standards/Guidelines.

3.1.2 Material Specifications

All piping materials shall be in accordance with the Project or Standard Specification for Piping Design and Materials. Alternative materials shall only be substituted if prior written approval is obtained from the COMPANY.

Reinforcing pads, wear plates, trunnions and other auxiliary attachments welded to the pipework shall be to the same or an agreed equivalent specification as the pipe or flange material.

Material certification, for pressure retaining components in hydrocarbon or process services, and bolting, shall be to BS EN 10204 type 3.1B. Remaining material shall be certified to BS EN 10204 type 2.2, certificate of compliance.

3.1.3 Material Handling and Storage

The CONTRACTOR shall be responsible for the off-loading, storage and control of all items supplied to him for fabrication and installation. The CONTRACTOR shall provide adequate storage facilities, under cover, for all piping materials.

Non-metallic slings shall be used for the handling of all piping and components.

Carbon steel, Alloy steel, Austenitic stainless steel and Duplex stainless steel shall be segregated and separate areas shall be set aside for the storage, fabrication and inspection of each material type.

On receipt, the CONTRACTOR shall verify all items of materials are properly marked / colour coded in accordance with COMPANY Specification and that the markings check against the corresponding material certification. Should any discrepancies be found, the material shall be quarantined and the COMPANY notified for resolution.

The CONTRACTOR shall maintain the identity of all materials. When small sections, or cut-offs, are issued for fabrication, the heat numbers shall be transferred by means of low stress dies, for ferrous material, or by vibro-etching, for all types of non-ferrous material. All transfers of material identification markings shall be witnessed and recorded by the Examiner.

Material that cannot be positively identified shall be rejected and stored in a Quarantine area unless it is re-verified by full chemical and mechanical testing to the COMPANY's satisfaction.

Materials will be delivered to the Fabrication Yard colour coded, as a simplified means of identifying different piping materials; however this will not eliminate the need to transfer original heat numbers.

Any additional colour coding / marking at the Fabrication Yard should be the same as the original identification marking done at the manufacturers.

For ease of identification during storage and when installed between flanged joints, gaskets of different material types shall be colour coded on their outside rim, ensuring that the gasket sealing faces are uncoated.

For ease of identification during storage and when installed between flanged joints, gaskets of different material types shall be colour coded on their outside rim, ensuring that the gasket sealing faces are uncoated.

Temporary items, such as gaskets or screens, shall be colour coded prior to installation by the CONTRACTOR for removal identification. The markings used shall be unique and clearly indicate that the items are "Temporary".

3.2 Welding

3.2.1 Welding Process

General

The CONTRACTOR shall develop Welding Procedure Specifications (WPS's), Welding Procedure Qualification Records (WPQR's) and a Welding Procedure Register (WPR) to cover the full range of materials to be welded and all necessary procedures needed during fabrication, including weld repair procedures. The above documents shall be approved by COMPANY in the light of relevant Specifications and Guidelines prior to commencement of fabrication.

Suitable previously qualified weld procedures and procedure qualification records, witnessed by an accredited Third Party Inspector, may be used, subject to written approval by the COMPANY.

The WPR shall contain the following information:

- Types of weld
- Consumables
- Welding position

Material types

- Qualified thickness range
- Welding procedure qualification number.

The procedures should be grouped and cross-referenced to the designated WPS. All welding shall be in accordance with ASME B31.3 and as noted herein.

The root gap of butt-welds shall be as per the Weld Procedure Specifications and permit consistent full penetration. The COMPANY reserves the right to introduce Magnetic Particle Inspection (MPI) and/or Dye Penetrant Inspection (DPI) of root runs for material classes ASME 900lb and above.

Backing rings shall not be used. No welded temporary attachments shall be used.

Ferrous Material

For piping 2 NPS and below the GTAW process shall be used for the first two passes with backing of Argon or Company approved gas composition. The remaining passes may be made with the SMAW or SAW processes.

Stainless Steel and Duplex Material

Stainless steel and Duplex pipework shall be welded using the GTAW process with backing of Argon. SMAW may be used after the first two passes following approval by the Company. The welding procedure shall be such as to introduce a minimum of 50% of filler wire into the joint. Preheat shall not be

used. The total heat input shall be kept below 1.5 KJ/mm and interpass temperature shall be kept below 150°C (300°F).

NACE Service Material

For all pipe sizes and all material grades in H2S services, the first two passes shall be by the GTAW process with a backing of Argon or COMPANY approved gas composition.

The hardness of any heat affected zone (HAZ) shall be tested and comply with the following:

- CS, LTCS, and Stainless Steel Type 316 - less than 248 HV10 / 22 HRC.
- Duplex - less than 285 HV10 / 28 HRC.

Amine Service Material

For all pipe sizes and all material grades in Amine services, the first two passes shall be by the GTAW process with a backing of Argon or COMPANY approved gas composition. For CS and LTCS, the hardness of any heat affected zone shall be tested and be less than 248 HV10.

All carbon steel and LTCS pipework shall stress relieved by post weld heat treatment, including all attachment welds (e.g., supports).

3.2.2 Welding Electrodes

Welding consumables used shall only be those established by weld procedure qualification testing.

Full details of the electrodes, such as chemical composition, physical properties and electrode Specification/classification shall be included in the welding procedure. Electrode equivalents shall not be used unless approved by the COMPANY in writing prior to use.

All welding consumables shall be low hydrogen consumables, unless otherwise approved (by the COMPANY) and supplied in hermetically sealed containers and stored in a dry environment. They shall be handled and used in accordance with the manufacturer's instructions and issued on a rotational basis, i.e. first in - first issued.

All electrodes intended for production shall be stored in a holding oven, at the Manufacturer's recommendations, for at least an hour immediately prior to issue. The electrodes shall be issued to the Welder in a hot box or a heated quiver held at a minimum temperature of 75°C.

At the end of the welders shift, or sooner if required by the Examiner, all surplus electrodes shall be returned to the stores for re-heating in a baking oven. Damaged, contaminated or unidentifiable electrodes shall be taken out of circulation and discarded.

SAW Flux that is not automatically retrieved shall be reconditioned in accordance with manufacturer's recommendation and be free of contamination. Reconditioned flux shall be diluted with 50% new flux.

3.2.3 Welding Procedures

Welding Procedure Specifications are required for each type of weld to be used for both shop and field welding. Preheating of welds and/or post-weld heat treating, when required, shall be part of the welding procedures. Welding procedures for each welding process shall be qualified in accordance with ASME Section IX as modified by ASME B31.3. Welding Procedure Specifications shall be approved by

the COMPANY before welding is started. The COMPANY shall witness weld procedure qualification and testing.

Post-weld heat treating (PWHT) procedures where required shall be qualified for the materials and thicknesses being used and submitted to the COMPANY for approval.

Tack welds shall be made using the same type of electrode as used to complete the joint.

Welding procedure specifications shall be recorded by the CONTRACTOR on proper forms, outlined in the ASME Section IX, or provided by the COMPANY, with sketches and test reports, to completely identify the welding process proposed and the procedure for performing the welding.

Procedures shall specify the type of welding electrodes, the type of filler metal and the storage procedure for maintaining the welding consumables during fabrication.

All welding procedures specifying Preheating and Post-Weld Heat Treatment shall indicate the following as appropriate:

- Pre Heat Temperature (maximum and minimum)
- Heat Rate (maximum)
- Holding Temperature (maximum and minimum)
- Holding Time
- Cooling Rate (maximum).

When shielding gases are used, the procedure must indicate the gas composition, its purity and its flow rate.

Welding variables such as current, voltage, gas flow rate and travel speed shall be specified within the range for which the procedure is qualified. For most processes this shall not exceed $\pm 15\%$. However, automated processes may require tighter limits where heat input must be strictly controlled to meet toughness requirements.

All weld procedures shall completely describe the joint preparation, position and direction of travel required to perform the welding.

Methods of cleaning and conditioning (e.g. power grinding or heat treating) the surfaces to be welded shall be detailed in the welding procedure specification and tailored for the base material for the beveling and welding processes.

For double-welded butt joints, (joints welded on both sides) the welding procedure shall specify the CONTRACTOR's proposed inspection procedure used to assure metal soundness after gouging and cleaning the backside of the weld.

If the CONTRACTOR proposes to utilize welding techniques other than manual, such proposals and description of the procedures to be employed shall be submitted to COMPANY for written approval prior to their qualification and use.

3.2.4 Welder Qualifications and Weld Identification

Welders used on pressure piping shall be qualified for the welds they are making in accordance with ASME Section IX as modified by ASME B31.3. In addition, as a minimum, welders used on field welds shall be qualified for low hydrogen electrodes ("F" Number 4) and positions 2G and 5G. Qualification to 6G position is preferred.

Qualification shall have been made within the last 90 days or within the preceding one year if written evidence is presented that the welder has satisfactorily welded on a job using the prescribed procedure within the last 90 days. Acceptance of previously qualified procedures shall be at the sole discretion of the COMPANY.

Tack welds performed in the root shall be made by qualified welders. Welder(s) making branch connection, socket weld or welding O-let shall be qualified for 5F position using a qualified procedure in accordance with ASME Section IX.

Each welder shall be assigned a unique identification number or symbol. The information shall be recorded on an identity card, complete with a photograph of the welder.

The CONTRACTOR shall maintain a permanent record of all welders used, showing each welder's name, identifying mark, qualification record, date of last certification and the testing laboratory. Copies of this record shall be available to the COMPANY on request.

3.3 Preheating and Postweld Heat Treatment

3.3.1 Preheat

The minimum Preheat temperature for welding, flame and arc cutting shall be in accordance with the Welding Procedure Specification.

Application of preheat shall be by electrical resistance methods or oxy-propane torches.

Deposition of carbon or direct flame impingement by incorrectly set or adjusted burners shall be avoided. Electric resistance heaters are the preferred method.

Preheat shall be applied in a gradual and uniform manner.

The preheat temperature shall be established on both sides of the joint preparation for a minimum distance of 75mm, or three times the material thickness, whichever is the greater. The heat source shall be removed to allow for temperature equalization (1 min for each 25mm of material thickness) before measuring the preheat temperature.

Austenitic and Duplex stainless steels shall not be preheated.

3.3.2 Interpass Temperature

The maximum interpass temperature shall not exceed that stated in the Weld Procedure Specification. The minimum interpass temperature shall be the preheat temperature for the material.

Measurement of interpass temperatures shall be by temperature indicating crayons, contact pyrometer or any other approved method of temperature measurement.

Crayons shall not to be used on Austenitic or Duplex stainless steels.

3.3.3 Post Weld Heat Treatment

The CONTRACTOR shall, prior to commencement, have a Company approved procedure.

No post weld heat treatment shall be performed on Austenitic and Duplex stainless steels.

Lines requiring postweld heat treatment are indicated on the line list and on the piping isometric.

Postweld heat treatment, (PWHT), shall be carried out in accordance with ASME B31.3 except as modified by this Specification.

NDT shall be carried out prior to PWHT of spools, to ensure no repairs are required, and again after PWHT to detect possible cracking caused by the heat treatment process.

The use of manually operated gas torches, gas rings or exothermic kits shall not be permitted.

Wherever possible, postweld heat treatment shall be carried out in an enclosed furnace.

For site or field welds, particularly "on site" welds, local postweld heat treatment shall be conducted. Procedures shall be developed by the CONTRACTOR and approved by the COMPANY prior to implementation.

Final NDT shall be carried out after PWHT.

4. Fabrication

4.1 General

The CONTRACTOR shall notify the COMPANY where applicable in writing at least seven (7) working days prior to the start of production welding, to enable inspection arrangements to be made.

The CONTRACTOR shall submit written procedures (as required by the relevant clauses in this Specification) to the COMPANY for approval prior to commencement of any activities.

The CONTRACTOR shall immediately notify the COMPANY of any incorrect or erroneous information.

Material identification and traceability shall be maintained throughout the fabrication, installation and up to and including final inspection.

Spool piece numbers shall be assigned by the CONTRACTOR and recorded on spool fabrication drawings. The pipe spools shall be identifiable at all times throughout fabrication, by the assigned spool piece number stenciled on the spool.

The open ends of pipe spools and partially completed field-run piping shall be kept covered at all times when not being worked on, by suitably fastened plastic sheeting.

4.2 General Fabrication Requirements

Fabrication of stainless steel, duplex and other alloy steel materials shall be performed in separate designated areas, to minimize the risk of cross contamination with carbon steel and other dissimilar materials, and with tools used only for this type of fabrication.

Only stainless steel wire brushes shall be used on stainless steel and duplex materials.

Grinding discs for use on stainless steels and duplex materials shall be resin bonded alumina or silicon carbide

If seam welded pipe is used the longitudinal seams in adjoining lengths shall be staggered over the top of the line preferably 30° left and 30° right of the centre line of the pipes. The seams shall be orientated to clear openings and external attachments.

Where a clash is unavoidable the CONTRACTOR shall notify the COMPANY for additional NDT requirements.

The installation of proprietary items shall be in accordance with the manufacturer's instructions.

Internals of in-line valves and equipment that could be damaged due to heat transfer shall be removed prior to welding and / or heat treatment.

Machine surfaces and grooves of flanges shall be carefully checked for defects prior to spool fabrication and if defective shall be replaced or repaired if possible. Flange facings shall be protected during fabrication and heat treatment.

Unless otherwise indicated on the drawings, all flange bolt holes shall straddle the natural vertical and horizontal centre lines of the pipe.

Internal weld surfaces of the butt welds at orifice flanges and other flow measuring instruments shall be ground flush, in accordance with ISO 5167.

Beveled ends may be cut and shaped on pipe for welding by machining, sawing or grinding. The edges shall have a true finish surface which is smooth enough for welding and which is free of drags, tears, slags, oil or dirt. Beveling techniques shall involve tools suitable to the parent metal so as not to create contamination. The tools shall be approved by the COMPANY.

For carbon steel flame (or arc) cutting is acceptable only if the cut is reasonably smooth and all oxides are removed from the flame cut surface by grinding.

For stainless steel flame cutting is not allowed, plasma cutting is required if pipe ends cannot be machined. Plasma cut ends shall be ground prior to welding.

All pipe spools shall, where applicable, have weld end preparations bevelled for welding unless indicated as a field fit weld on the drawings. Weld preparation for a field fit weld shall be prepared after trial fitting.

The number of welds in a spool shall be kept to a minimum.

Pipe lengths up to 3 metres long shall be of single piece construction and shall not be formed by welding together short sections of pipe.

The minimum distance between full penetration butt welds shall be 50mm or 6 times the pipe wall thickness, whichever is greater. Should there be instances where this distance cannot be maintained then the material must be stress relieved in accordance with ASME B31.3.

On all socket weld joints a gap of 1.5mm (0.06") shall be left between the bottom of the socket and the end of the pipe to prevent "bottoming" in the socket. Prior to piping fabrication, the CONTRACTOR shall submit for review and approval by the COMPANY, a procedure for consistently achieving this gap.

Bending of pipe at site is not permitted unless the COMPANY gives prior approval. Where COMPANY drawings show bending of pipe the CONTRACTOR shall submit a procedure for bending for COMPANY review and approval.

Pulled bends may be used in Utility Services, for lines 3 NPS and below, only where indicated on piping isometrics and subject to prior written approval by the COMPANY.

Pulled Bends shall not be used in hydrocarbon or process services unless specified as a Special Piping Item.

Bending of duplex or stainless steel pipe is not permitted.

Miter bends shall not be used.

All branch outlet fittings, O'Lets, shall be fully welded out in accordance with the O'Let manufacturer's recommendations. The welds shall blend smoothly into the main header run and have no undercuts.

All O'Let fitting identification should be copied, with paint marker, on the surface of the fitting away from the weld area to avoid loss of identification during welding.

Where reinforcing pads are specified, e.g., for stub-ins or attachments for pipe supports, they shall be in accordance with the applicable Engineering Standard details and be accurately shaped to suit the pipe diameter. The welding of reinforcing pads to the pipework shall be carried out only by fully qualified welders and with COMPANY approved welding procedures. Each pad shall have, for venting and testing purposes, a 6mm hole which shall be filled with mastic after successful completion of NDE and pressure testing.

Trunnions or dummy branches shall be welded to the header pipe using fully penetrated groove welds and finished with cover fillet welds as per ASME B31.3 FIG. 328.5.4D(1) and (3) for reinforced trunnions.

4.3 Fit-up

To preclude extraneous loads and to minimize strains during tacking, the pipework shall be properly supported and aligned by jigs or clamps as required. This shall be carried out in a manner which will not damage the pipework e.g. dogs shall not be used.

Pipe clamps or jigs for stainless steel and duplex materials shall be made of stainless steel or have nonmetallic contact faces to prevent contamination.

Cold spring or forcing of pipe for joint making is not permitted.

4.4 Tolerances

The dimensional tolerances on completion of fabrication shall be in accordance with ASME B31.3 and as detailed below. Linear tolerances shall not be cumulative. Length and other linear dimensions have a tolerance of $\pm 2\text{mm}$.

Flattening

- Piping subject to internal pressure, 8% of nominal pipe size
- Piping subject to external pressure, 3% of nominal pipe size

Flange Face Alignment

The plane across the gasket seating surface shall be perpendicular to the theoretical centre-line of the pipe to within 5mm/m ($\frac{1}{4}$ degree).

Bolt Hole Location

Deviation from centre-line, $\pm 1.5\text{mm}$

Alignment of Bores (Line joints)

- Piping with wall thickness 6mm and above $\pm 1.5\text{mm}$
- Piping with wall thickness below 6mm, $\pm 25\%$ of the pipe wall thickness

Angular dimensions of bends and branches, $\pm \frac{1}{4}$ degree.

4.5 Non-Metallic Piping

Fabrication, installation and testing of non-metallic piping, such as PVC, GRE, ABS, or HDPE, shall be performed in accordance with the recommendations of the piping materials manufacturer. The specific fabrication installation and test procedures shall be reviewed and approved by the COMPANY prior to any work being implemented.

5. Repair of Defects

5.1 General

This section covers the repair of defects or damage in piping materials and welds.

CONTRACTOR shall submit for approval, detailed procedures for any proposed repair work to fully welded joints, defective or damaged piping material, or any other pressure retaining parts. Repair work shall not be carried out until written approval of the procedures has been obtained from the COMPANY.

A record shall be maintained of the location of all repaired areas. The cause of any defects shall be established prior to repair, and reported to the COMPANY.

5.2 Minor Surface Repairs

Surface marks or abrasions shall be cleaned and carefully examined. Minor surface imperfections, damage to pipe materials or fittings may be removed by grinding providing the minimum wall thickness is not reduced locally by more than 12.5% of the nominal wall thickness.

The ground area(s) shall be carefully dressed to ensure a smooth transition with the surrounding surface and shall have no notches. The ground areas shall be examined by Magnetic Particle Inspection (MPI), or Dye Penetrant Inspection (DPI), as applicable.

Defects or damage to flanges faces, machined or seating surfaces shall be repaired to a COMPANY approved repair procedure.

5.3 Correction of Distortion

The application of heat to piping components by line heating or flame straightening is prohibited.

5.4 Repairs by Welding

All repair welds shall be completed in accordance with an appropriate procedure, as approved by the COMPANY, and by qualified welders.

Only one attempt at a repair is permitted without approval from the COMPANY.

Repair welds on longitudinal and/or circumferential weld seams, when approved, shall be separated by at

least 100mm or the complete area cut out.

When a defect falls outside the parameters of the approved repair procedures the defect shall be cut out.

The defects shall be carefully removed by machining, grinding or arc air gouging followed by grinding. Where arc gouging is used, a qualified and approved gouging procedure specification shall be applied. The excavation shall extend at least 25mm beyond the extremities of the defect and shall have a smooth transition to the parent metal. The repair weld preparation shall be smooth, with a regular contour, and shall be free from rust grease, oil or other extraneous material.

Peening of weld runs or the finished welds shall not be permitted.

The CONTRACTOR shall make every effort to minimize residual stresses.

6. Inspection and Testing

6.1 Inspection

Inspection of piping shall be in accordance with the requirements of ASME B31.3 and this Specification prior to any painting or coating being applied. Inspection shall include 100% visual examination and any other additional examination necessary to ensure compliance to this Specification.

The CONTRACTOR shall be responsible for supervision and for the quality control of work during fabrication and erection. The COMPANY may make inspections, audits and tests as required to check the progress and assure quality of the work, qualifications of CONTRACTOR's employees and that work complies with the Drawings and Specifications.

The COMPANY shall have the right to examine all aspects of the work at any reasonable time during fabrication, testing or on completion. Any work which, in the opinion of the COMPANY, does not comply with the requirements of this Specification shall be corrected by the CONTRACTOR at his own expense.

Acceptance by the COMPANY of testing and quality control procedures submitted by the CONTRACTOR will not relieve the CONTRACTOR of his responsibilities and/or guarantees.

All root runs shall be 100% visually inspected by the welder prior to filling and capping. This shall include the internal surface where accessible.

All weld passes shall be visually inspected to ensure freedom from defects and slag.

All welds in NACE and Amine Service pipework shall be tested for hardness, one test per butt weld on the weld metal.

Random examinations shall be performed progressively throughout the job and for every thickness of material. At least one of each type and welding position of weld made by each welder shall be examined.

All pipework shall be checked against the design drawings and other related documents to verify that it meet all the requirements of the drawings and this Specification.

6.2 Non-Destructive Testing (NDT)

The CONTRACTOR shall submit to the COMPANY detailed NDT procedures for approval. NDT shall be carried out in accordance with the approved procedures.

The CONTRACTOR shall co-operate fully with the COMPANY in all aspects of NDT and shall provide all assistance and access that the COMPANY may request.

The methods and acceptance levels for NDT referred to in this Section, shall be conducted in accordance with Table 1.

Examiners, Operators and equipment shall be approved by the COMPANY. For any testing less than 100% the stated frequency (e.g., 1 in 10), the joints selected shall be at the discretion of the COMPANY. The COMPANY shall nominate the welds to be tested when random sampling NDT is required.

6.3 NDT Qualifications

The CONTRACTOR shall use only NDT Operators and Examiners who are qualified to ASNT or internationally recognized standard, have experience in the examination of the weld type to be examined, and recognized by the local Pakistan Health and Safety Authority.

Operator and Examiner qualifications shall be subject to approval by the COMPANY.

6.4 NDT Reports

NDT reports shall contain all the information specified in the applicable standard and NDT procedure. This includes:

- Identification of NDT contractor
- Report number and date of issue, date of test
- Description of item under test (traceability)
- Procedure number, equipment used including serial numbers
- Records of discontinuities detected
- scale drawing showing precise location from a given datum, orientation, and size of relevant discontinuities
- test sensitivity/accuracy
- Acceptance criteria
- Name of technician
- Statement of compliance or otherwise
- Details of test restrictions, or deviations from NDT procedure

6.5 Methods of Non-destructive Testing

TABLE 1

TESTING ACTIVITY	STANDARD	ACCEPTANCE CRITERIA
Visual	ASME V – Article 9	ASME B31.3
Radiography	ASME V – Article 2	
Ultrasonic	ASME V – Article 5, 23	
Magnetic Particle	ASME V – Article 7	
Dye Penetrant	ASME V – Article 6	

6.6 Extent of NDT

The NDT requirements are according to the Groups shown in Tables 2 and 3 are based on temperature, pressure and fluid criticality.

As a minimum, two of the first five circumferential welds made by each welder, and each combination of welders, shall be subject to 100% radiography. Thereafter, 100% radiography shall be performed for one weld in each 20 welds for each welder.

TABLE 2

METHOD	GROUP 1	GROUP 2	GROUP 3
VISUAL	100%	100%	100%
MT (or PT for non ferromagnetic materials) (Note 3)	100%	10% of branch and attachment welds	10% branch and attachment welds
RT (butt weld) (Note 1)	100%	100% coverage on 1 in 10 welds	100% coverage on 1 in 20 welds
UT (branch welds) (Note 2)	100%	0	0
Acceptance Criteria per ASME B31.3 Table 341.3.2	As for Normal fluid service	As for Normal fluid service	As for Normal fluid service
Hydrotest (or Pneumatic Test)			
Shop Fab Spools	Hydrotest	Hydrotest	Hydrotest
Post Erection	Hydrotest or Pneumatic	Hydrotest or Pneumatic	In service Leak test
Minimum Duration	1 hour	1 hour	N/A
Records	Yes	Yes	Yes

Notes:

- 1) Or UT where allowed.
- 2) Not required where wall thicknesses for scanning surfaces are less than 10mm, and where branch diameters are less than 4 NPS. Non ferritic materials need not be examined.
- 3) MT or PT of branch welds to be performed prior to attachment of compensating plate if applicable.
- 4) Also refer to Pressure Testing section.

TABLE 3

GROUP	DEFINITION. Where the following conditions apply :-
Group 1	ASME Class 900 Rating and above for all services or fluids and all ASME classes for Lethal Substances.
Group 2	ASME Class 150, 300 or 600, for all services except :- <ul style="list-style-type: none"> • Category 'M' Fluid Service (Lethal Service) - Refer to Group 1. • Category 'D' Fluid Service - Refer to Group 3. nb. For definition of Categories, see ASME B31.3.
Group 3 (Service Test)	ASME Class 150, when design pressure does not exceed 1035 kPag (150 psig) and when the service or fluid content is :- <ul style="list-style-type: none"> • Potable Water • Service Air • Instrument Air • Fresh Water • Nitrogen / Inert Gas

6.7 Radiographic Examination

Where the double wall double image exposure technique is employed, two exposures will be sufficient for pipe sizes up to 2 NPS and a minimum of three exposures for pipe sizes between 2 NPS and 3 NPS. Above 3 NPS, the double wall single image or single wall single image technique shall be employed and sufficient exposures shall be made to ensure that the weld seam is fully radiographed and that a minimum of 50mm overlap takes place.

Only fine grain high contrast film or ultrafine grain high contrast film may be used. Wire type image quality indicators and film sensitivity shall be equal to EN-462-1. Only lead intensifying screens shall be used. The minimum radiographic density in the weld area shall be 2.0. The maximum radiographic density shall be 4.2 for all areas of the weld including parent material. Radiation source shall not be greater than Ir-192, 60 Ci.

Use of Gamma Ray for examination is not permitted without prior approval by COMPANY.

6.8 Ultrasonic Examination

Ultrasonic examination may be used in place of radiography for Carbon steel over 19mm thick, if approved by the COMPANY. UT shall not be performed on materials whose thickness is less than 10mm or where scanning surface pipe diameters are less than 4 NPS.

As a minimum requirement, ultrasonic examination shall be conducted using a minimum of three angled transducers, usually 45°, 60° and 70° operating between 2 and 5 MHz. Prior to conducting ultrasonic examination, the CONTRACTOR shall ensure that the weld deposit and surrounding area is sufficiently smooth to avoid false or misleading indications. The maximum surface compensation factor shall be 6dB.

6.9 Magnetic Particle/Dye Penetrant Inspection

All weld areas to be examined by magnetic particle or dye-penetrant techniques shall be sufficiently smooth to avoid false defect indications. Care shall be exercised during magnetic particle inspection to minimize electrode or probe arc strikes.

6.10 Storage of Radiographs

Finished radiographs shall be retained by the CONTRACTOR for a minimum period of 3 years from the completion of manufacture.

All radiographs shall be stored in such a manner as to prevent deterioration over time as a result of light, pressure, excessive heat, excessive humidity, fumes or ionizing radiation as appropriate. Reference should be made to the radiographic film manufacturers recommendations on storage.

The CONTRACTOR shall allow free access to radiographs at all times during the 3 years' storage period to the COMPANY and/or his representative.

7. Cleaning Pipe

After fabrication and heat treatment, all fabricated pipework shall be cleaned by a blast of high pressure air assisted where necessary by hand-held wire brushes to remove accumulations of sand, scale masking tape, weld splatter, cutting chips and other foreign matter before the spools are coated and packed for shipment, or are installed in the piping system. A visual examination shall be made of each spool to assure it is clean.

Chemical cleaning or steam cleaning shall be used where specified to clean piping following fabrication. The CONTRACTOR shall submit a procedure for chemical or steam cleaning where this activity is specified by the COMPANY.

Wire brushes and other cleaning tools shall be free of oil, scale and other contaminants.

Compressed air for blasting and grit cleaning shall be free from oil, water and grease.

Immediately after the piping has been inspected for internal cleanliness, the pipework shall be sealed off using suitable closures, such as metal or plastic end caps.

Austenitic and duplex stainless steel piping shall be inspected for ferritic contamination and any such contamination shall be removed.

8. Installation

8.1 Pipework Erection

All piping shall be erected in accordance with the associated piping drawings and documentation.

All pipework shall be inspected prior to erection to ensure it is free from dirt, scale, weld spatter and other foreign matter.

Straight run pipe shall not be pulled through pipe racks.

Piping shall be supported, guided or anchored as shown on the piping and support detail drawings. Where possible, pipework shall be erected on the permanent supports, designated for the line.

During erection of pipework, suitable temporary supports are to be provided to ensure that no undue stresses are imposed on the pipe. Temporary supports shall be specially marked, colour coded by the CONTRACTOR, and removed on completion of work.

Care shall be taken to avoid undue strain being placed on a vessel or item of equipment etc. by unsupported lengths of piping.

Heating of pipework to achieve alignment of spools for closing welds or alignment of flanges at equipment shall not be permitted.

Rotating equipment shall be fully earthed prior to field welds of mating piping in order to avoid stray currents through bearings.

Drainage falls shall be maintained throughout as specified on drawings.

Locking pins from spring supports shall not be removed until after hydro-testing is complete.

8.2 Flanged Joints

During installation and erection, immediately prior to joint make-up, all flanged joints shall again be carefully checked for defects or damage to the flange facing or ring joints. If defective, the flanges are to be repaired to a COMPANY approved repair procedure.

All open flanges not being worked on shall be covered with a blind flange or suitably fastened plastic sheeting, to avoid ingress of sand or other foreign matter.

Flanged joints shall be brought up flush with the gaskets and checked for parallel and lateral alignment. The bolts shall be tightened uniformly and in opposing sequence so that the entire flange face, or groove, bears uniformly on the gasket.

Care shall be taken when bolting flanges of dissimilar materials, e.g. steel to cast iron or aluminum or bronze, to avoid damage to the weaker flange.

All bolting shall move freely through the flange bolt holes.

8.3 Equipment Flange

It should be noted that vessel flanges generally, may not be set sufficiently true to permit prefabrication of the mating pipe spools without checks being made.

Where drawings show flanges loose on a closure length of piping a careful physical check shall be made of closing distance and alignment of flange before cutting the pipe and welding on the flange.

CONTRACTOR shall ensure that no stress is placed on equipment due to misalignment of flanges. Flanges connecting to strain sensitive mechanical equipment e.g., pumps, vessels, in-line instruments etc. shall be fitted up in close parallel and lateral alignment prior to tightening the bolting. To achieve this true alignment, full advantage shall be taken of the 'cut to fit' allowances. Flange connections to "Strain Sensitive Equipment" shall be the last connection made on completion of a line or interconnecting system of lines complete with permanent supports.

All spools connecting to a compressor or pump shall be final field fitted after installation and alignment of the compressor or pump has been completed. Flange alignment shall be such that at fit-up there are no loads on the compressor or pump nozzles. CONTRACTOR shall submit a procedure for alignment of flanges on to rotating and reciprocating equipment. Installation of pipework to compressors and pump nozzles shall be strictly monitored by the Examiner.

All openings in vessels, columns and other similar equipment items shall be clean and free from obstruction prior to being connected to pipework.

Unless hydrostatic test blanks are fitted at connections to equipment, the pipework shall be sealed off using suitable closures to protect the equipment against ingress of internal pipe debris during ongoing erection of the piping.

8.4 Gaskets

CONTRACTOR shall ensure the correct gasket material and thickness, as specified in the Specification for Piping Design and Materials and on piping drawings and isometrics, is used.

Care shall be taken to ensure the gasket and mating flanges are clean, true and free from defects.

CONTRACTOR shall ensure that the gasket does not, under any circumstance, protrude into the bore of the pipe.

When bolting flange joints with spiral wound gaskets, the gasket shall be compressed evenly to the thickness of the guide ring. This would be equal to 25% to 35% compression of the original gasket thickness (gasket compression shall be spot checked during bolt tensioning).

Spiral wound gaskets shall not be re-used after dismantling.

Ring joint gaskets may be reused if undamaged and fit for purpose.

8.5 Bolting

CONTRACTOR shall ensure that the correct grade of bolting as specified in the Specification for Piping Design and Materials and on piping drawings is used.

A COMPANY approved lubricant, an anti-seize or anti-rust compound, shall be applied to all flange bolts before joints are assembled except that lubricant shall not be applied to bolts when using bolt tensioning equipment or to PTFE coated bolts.

All bolts shall extend fully through their nuts to expose, as a minimum, one complete thread.

Hydraulic bolt tensioning systems approved by the COMPANY shall be used on all bolts of 1¼ inch diameter and larger. Bolts will be supplied one diameter length longer than standard length and complete with three nuts. The extra nut is for use as thread protector.

The CONTRACTOR shall be responsible for all bolt torque requirements and their applications.

All actual bolt torque values shall be measured for every bolt 1¼ inch diameter and larger in pipe classes 600 flange rating and above and submitted to the COMPANY for approval.

8.6 Valves

All valves shall be stored in accordance with the Manufacturer's recommendations and installed as shown on the piping drawings. They shall not be left unprotected until fitted in the line.

The gland packing of valves shall be checked and, if necessary, tightened during hydro tests.

8.7 Threaded Pipework

Pipe ends shall be cut square, threaded, reamed and cleaned to remove cuttings from internal and external surfaces. All threading shall be carried out after bending, forging or heat treatments but where this is not possible suitable thread protection must be provided.

All threaded connections shall to be to ASME B.1.20.1 NPT, unless otherwise specified.

All joints shall be tightened using a suitable wrench; connections 2 NPS and larger shall be tightened using a 'RIGID' compound leverage pipe wrench or equivalent. Excessive Wrench markings on pipe and fittings may be cause for rejection of the fabrication at the discretion of the COMPANY.

Except in specific material applications, for example galvanized material class, threaded connections may be used only where joints must be disconnected, such as an interface with instruments or equipment.

The use of threaded joints is not permitted within hydrocarbon and process material classes upstream of a primary block valve except where connection to equipment or instrumentation is required. If use of a threaded connection is unavoidable and when indicated on piping isometrics, the item shall be "seal" welded with all exposed threads covered.

A COMPANY approved jointing compound or PTFE tape shall be used on threaded connections to ensure adequate sealing, except where connection is to be seal welded.

PTFE tape shall not be used for pipework having a service temperature over 200°C, and shall not be used for lube oil piping systems.

8.8 Small Bore Piping

Small bore piping, DN40 and below, shall be run in the 3-D model by the CONSULTANT to confirm routing of the lines and to ensure material is allocated for MTO purposes.

The CONTRACTOR shall install these lines as shown in the 3-D model. Should there be instances where a line clashes with any obstruction, it shall be re-routed by the CONTRACTOR, Field Run, in accordance with good engineering practices after getting COMPANY's approval.

9. Flushing

9.1 General

An initial flushing shall be carried out prior to pressure testing. Ball Valves shall be flushed in the fully open position.

Safety aspects shall be considered for each system with particular attention being given to circuits that are subject to Pneumatic Flushing and Pneumatic Testing

Details of procedures to be employed shall be incorporated in the Test Packs.

During flushing and testing the test areas shall be cordoned off and only authorized personnel allowed within the test area boundaries.

9.2 Hydro Flushing

The water used for flushing shall be as per the Hydrostatic test requirements for the line. Refer to the Line List and / or individual Test Pack.

Piping systems 4 NPS and smaller shall be flushed by a High Velocity Water Flush (HVWF). Water velocity shall be 7 m/s minimum.

Piping systems 6 NPS and above shall be flushed using proprietary high pressure water jet flushing equipment, such as rotating hose or rotating nozzle.

After completion of flushing, the system shall be completely drained. A pressure test should then normally be carried out within 24 hours. If this is not practical, the circuit shall be dried and protected from ingress of sand or other foreign matter.

9.3 Pneumatic Flushing

Air will be the medium normally used.

Safety aspects shall be considered for each system. Piping systems 2 NPS and smaller shall be flushed by a Pressurized Air Flush (PAF).

Air velocity shall be 35 m/s minimum.

PAF may only be used after getting COMPANY approval:

- For initial cleaning of lines subject to pneumatic testing.
- For initial cleaning of small bore piping, 2 NPS and smaller.
- Where drying of lines, where water in a system is not desirable.

Piping systems 3 NPS and above shall be flushed by means of Pressurized Air Shock blowing (PAS). Where 'PAS' is used, the Air Shocking pressure shall not exceed the working pressure of the system and shall not be more than 800 kPag.

10. Testing

For Testing, refer Specification Doc. No. 0504196-MEC-SP-004 "Standard Specification for Pressure Testing of Piping System".

11. Certificates and Records

A system of documentation and identification shall be established and maintained by the CONTRACTOR. The methods used shall be agreed between the CONTRACTOR and the COMPANY.

These shall include, but not be limited to the following:

- a) Welding Procedure Specifications
- b) Welding Procedure Qualifications
- c) Welder/Welding Operator Qualifications

- d) List of Welders including processes materials and positions for which they are qualified
- e) List of welding procedures with details
- f) Post weld heat treatment procedures
- g) Post weld heat treatment records
- h) Nondestructive testing (NDT) procedures
- i) NDT Operator Qualifications
- j) NDT records
- k) List of NDT Operators and Examiners
- l) Welding consumable handling procedure
- m) Flux handling and recycle procedure
- n) Repair procedure
- o) Spool numbering
- p) Test pack numbering and pressure test records, including reinforcing pads testing.
- q) Records of any agreed concessions to the specified standards
- r) Mill Certificates
- s) Welding Consumables batch Numbers
- t) Welding and NDT Traceability Records
- u) As-Built Drawings
- v) Material Safety Data Sheets

Notes:

- 1) Items a, b, c, f, h, l, m and n are to be approved in advance of use.

12. Preparation for Shipment

All piping shall be dry and free from all water, grease, oil, dirt and loose foreign materials.

All flange faces, threaded ends and other machined surfaces of all piping, including spectacle blinds, spades & spacers etc., shall be coated with a removable rust preventative applied as recommended by the manufacturer.

Gasket contact surfaces shall not be painted. If the surface is painted or damaged it shall be restored to the original specification condition before application of protection.

All flange gasket contact surfaces shall be protected against damage in shipment by attaching a metal blank or a 20mm thick wooden blank. The blanks shall be securely and tightly attached by wiring or bolting through at least four bolt holes.

Threaded connections shall be protected by a thread protector. They shall be provided with a plastic thread protector or a steel pipe cap or plug.

Plain or beveled ends shall be closed off with a metal or plastic cover to protect the inside of the pipe and to prevent the ingress of water or dirt.

All handling, loading and unloading of spools/pipework shall be carried out with care in order to minimize mechanical damage. Lifting shall be carried out with slings, or other COMPANY approved methods.

Spools/pipework which is likely to be damaged during handling operations e.g., small bore piping, shall be given adequate protection. Care shall be taken in handling and storing that carbon steel, alloy steel and stainless steel materials shall not be mixed. Various types and grades of materials shall also be stored separately.

13. Traceability Requirements

Material and weld traceability will form part of the permanent documentation to be compiled and provided by the CONTRACTOR. The CONTRACTOR shall supply the COMPANY with copies of the following certificates and records; the number of copies to be as stated in the contract.

All pipe material on receipt shall be identified with a unique ID number to enable traceability during fabrication for Group 1 materials.

	GROUP 1	GROUP 2	GROUP 3
Heat No./Unique ID No. of material	Yes	Yes (Note 1)	-
Weld Number	Yes	Yes	-
Welder ID	Yes	Yes	Yes
WPS	Yes	Yes	Yes
Consumable Batch	Yes	Yes	-
NDT Results	Yes	Yes	Yes
Weld Repairs	Yes	Yes	Yes
PWHT	Yes	Yes	-
Hydrostatic Results	Yes	Yes	Yes
Pneumatic Results	Yes	Yes	Yes

Note 1: Full material traceability is required for the process and hydrocarbon lines but for utility lines, e.g., air, water services, material traceability is limited to initial receipt inspection.

Records of each weld shall be maintained by the CONTRACTOR and shall be identified by a unique weld number which shall be indicated on "As Built" Isometrics.

14. Quality Assurance

CONTRACTOR shall have in place, or implement and maintain a Quality Assurance System which meets the requirements of this document and ISO 9001 or 9002 as appropriate.

APPENDIX-A2



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
INSULATION

DOC. NO: 0504196-MEC-SP-002

ENGINEERING CONSULTANT:



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Disclaimer

This Specification has been prepared on behalf of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and for the exclusive use of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and is subject to and issued in accordance with the agreement between Petrochemical Engineering Consultants (PEC) and OGDCL. PEC accept no liability or responsibility whatsoever for it in respect of any use of or reliance upon this Specification by any third party.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
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1. DEFINITIONS

Company	OIL & GAS DEVELOPMENT COMPANY LIMITED (OGDCL)
Consultant	PETROCHEMICAL ENGINEERING CONSULTANTS (PEC)
Contractor	The person or persons, firm or Proprietor, whose proposal, has been accepted By the COMPANY for construction, installation / erection, testing and Completion as of works mentioned in the SOW
Vendor	Organization which produces and/or supplies items (material, equipment etc.) And/or services to carry out the duties as specified by the Company.
May / Can	Indicates a recommendation
Shall	Indicates a mandatory requirement
Should	Indicates a strong recommendation (require justification if not followed)

2. INTENTION

The intent of this document is to describe the minimum acceptable parameters/requirements for the **Insulation**. The Contractor / Vendor / Supplier etc. shall review these in the light of latest edition/version/revision/issuance/publication of all applicable National and/or International Rules, Regulations, Laws, Ordinance, Recommended Practices, Design Standards, Guidelines, Best/Good Engineering Practices, Government Notifications, etc. If any requirements are not found/stated in this document, or found but are less conservative/stringent, the most conservative/stringent requirements shall be followed without any negative cost, schedule, quality and scope impact to the Company.

3. ERROR OF OMISSION

The review and comments by Company / Company representative shall only indicate acceptance of general requirements and shall not relieve the Contractor / Vendor / Supplier etc. of its obligations to comply with the requirements of this document and other referred documents.

4. CONFLICTING REQUIREMENTS

In case of any sort of conflicts, inconsistencies or ambiguities, the Contractor / Vendor / Supplier etc. shall inform the Company in writing, seek clarifications and resolve the conflict. The Company decision shall be considered final.

5. CODES AND STANDARDS

5.1 GENERAL

All codes, standards, specifications and other documents shall be the latest and company approved (where applicable) issue on the date of purchase order and it shall be the Contractor's / Vendor's / Supplier's responsibility to comply with the same.

The Contractor's / Vendor's / Supplier's shall ensure that Insulation comply with requirements of all federal, provincial and regional acts, regulations and ordinances.

5.2 LIST [LATEST EDITIONS SHALL BE FOLLOWED]

ASTM

ASTM A167	Stainless and Heat Resistant Chromium Nickel Steel Plate, Sheet and Strip;
ASTM B209	Aluminum-Alloy Sheet and Plate;
ASTM C168	Definition of Terms Relating to Thermal Insulation of Materials;
ASTM C449	Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement;
ASTM C547	Standard Specification for Mineral Fiber Pipe Insulation
ASTM C610	Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation
ASTM C533	Calcium Silicate Block and Pipe Thermal Insulation;
ASTM C585	Standard Practice of Inner and Outer diameters of rigid Thermal Insulation for Nominal sizes of Pipe and Tubing(NPC) System
ASTM C592	Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type);
ASTM C612	Mineral Fiber Block and Board Thermal Insulation;
ASTM C795	Insulation Materials for Application to Austenitic Stainless Steel.
ASTM E96	Test methods for water vapor transmission of materials

NACE

NACE MR 0175 Materials for use in H₂S-containing environments in oil and gas production

BS

BS 874	Methods for determining insulating properties with definitions of thermal insulating terms
BS 5422	Specification for the use of thermal insulating materials
BS 5970	Thermal insulation of Pipework and Equipment

ISO

ISO 9001	Quality Management
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The following Project Specification shall be used in conjunction with this Specification where applicable:

- Standard Specification for Painting (0504196-MEC-SP-003)

6. GENERAL REQUIREMENTS

6.1 GENERAL

All surfaces (to be insulated) shall be thoroughly cleaned to ensure removal of all dirt, grease, rust, scale, oil, weld spatters, etc. and shall be perfectly dry before application of insulation. All testing (e.g., hydrostatic testing, NDT, etc.) as well as application of anti-corrosion paint and/or coating shall be performed prior to the application of insulation.

Any protrusions from piping and equipment (e.g., vents, thermo-wells, etc.) shall be covered under this Specification, and shall be insulated accordingly.

Provisions shall be made in the insulation for contraction/expansion of the piping and equipment. Contraction/expansion joints in the insulation shall be located to eliminate any undue stress on the insulation.

Insulation shall not cover the face of gauge glasses, equipment name or data plates or tags, nor be applied so as to interfere with dynamic parts of instruments or equipment.

All openings in metal jacketing for man-ways, nozzles, nipples, pipe supports, etc., are to be neatly cut to provide a snug fit and shall be thoroughly sealed and weather-proofed to prevent moisture from penetrating under the jacket. Openings shall be fitted with a metal collar or suitable flashing embedded in sealant and screwed firmly in place.

At all flanges, unions, and pipe terminations, the pipe insulation shall be beveled at a 45° angle to facilitate removal of flange bolts and union collars without damage to the main pipe insulation and metal jacketing. A screwed and sealed metal cover shall be installed.

Metal screws shall not be used on cellular glass insulation.

The thickness of basic insulation on pipe fittings shall be the same as the thickness of insulation of adjoining pipe.

All insulation shall be clad with metal jacketing as far as is reasonably practical. Jacketing shall be installed so as to shed water and protect against wind and blowing rain.

The insulation shall be applied in accordance with good industrial practices, and after application, shall have a neat appearance to the satisfaction of the Company.

Circumferential and longitudinal joints in cladding shall be arranged for good water drainage and lapped. All laps to be sealed with silicone sealant installed in the lap. Flat horizontal surfaces shall be slightly sloped to naturally shed water. PVC tape shall be installed between dissimilar metals to prevent bimetallic corrosion.

All insulation work shall be subjected to inspection. Any consequent repairs shall be rectified by the contractor at his own expense.

All insulation materials shall be stored in an area protected from the weather and kept dry before and during application. On outdoor lines or equipment, no more insulation shall be applied than can be completely sealed by the end of each work day.

Where insulation is required on the outside of piping, vessels or equipment that extends through an exterior building wall or roof, the insulation shall not stop at the exterior of the building but shall be extended for 300 mm inside the building.

Piping operating above 70°C and located within 150 mm of electrical conduit or Galvanized steel wire armor (GSWA) cable shall be insulated for a distance of 300 mm on either side of the conduit or GSWA cable.

Insulation shall be provided for all instrument leads; instrument tubing, instrument bridles, plugs and all other directly connected instruments wherever there is a possibility of freezing.

6.2 MATERIALS

6.2.1 General

All materials supplied shall be new and undamaged. All insulation material shall be properly stored and protected from moisture during all stages of handling and application.

Insulation materials containing asbestos or polyurethane shall not be used. All insulation materials selected shall conform to the regulations of the latest edition of the Occupational Health and Safety Act and all other applicable standards. Insulation materials applied to austenitic stainless steel shall meet the requirements of ASTM C-795.

It is not the intention of this document to restrict materials to the listed brand or trade names (as specified under Section 6.2 and Annexure-II). After Company approval, well-known and accepted equals/better materials may be used. Insulation material must be chloride free for applications where the pipe-work or equipment is stainless steel.

6.2.2 Piping Insulation

Temperature Limits	Material
15 Deg. C to 750 Deg. C	Calcium silicate, factory fabricated Manson Calmax or equal.
-25 Deg. C to 200 Deg. C	Glass fiber, factory fabricated, Manson Alley K or equal.
-175 Deg. C to 685 Deg. C	Cellular glass, factory fabricated, Pittsburgh Corning Foamglass or equal.

Glass fiber pipe insulation shall not be used in locations where damage to the insulation can occur as a result of walking on lines or from any other cause that may arise during normal operation or required maintenance of adjacent equipment or facilities.

6.2.3 Vessels and Equipment Insulation

Calcium silicate (Manson Calmax or equal) shall be used for hot service. Cellular glass (Pittsburgh Corning Foamglass or equal) shall be used for cold service.

Polyisocyanurate Foam may be used for cold service with COMPANY's approvals.

6.2.4 Adhesives, Cements, Coatings and Sealers

Adhesive:	Pittcote 88 or equal
Finishing Cement:	Thermocote 1-FW or equal
Insulating Cement:	Thermocote 1-GP/FF, Thermocote 1-FW, or equal
Joint Sealant:	Pittseal 444 or Chil-Pruf CP-22/23 or 24
Vapour Barrier:	Bakelite 110-14, Pittcote 300 or equal
Weather Barrier:	Bakelite 110-14, Pittcote 404 or equal
Weather-proofing:	Childers CP-10 and 11 Vi-Cryl, Bakelite 100-14 or 44, or equal

Flashing compound shall be a silicone mastic or equal.

Expansion joint filler material shall be mineral wool fiber or glass fiber with temperature limits equal to or better than the required operating temperatures.

6.2.5 Miscellaneous Materials

Wire Mesh:	25 mm nominal hexagonal mesh of 20gauge (0.9 mm) galvanized steel wire
Metal Screws:	No. 8 x 14.3 mm self-tapping hex head pan head type 305 stainless steel
Glass Fabric:	Glassfab (open weave)

S-clips: 0.5 mm x 12 mm type 304 stainless steel
Expansion Springs: Childers Chill - Springs or equal

6.2.6 Securements and Coverings

6.2.6.1 Securements

16 gauge (1.6 mm) type 304 stainless steel wire shall be used to secure pipe insulation and insulation around fittings and equipment;

0.5mm x 19mm wide type 304 stainless steel bands shall be used to secure insulation and metal jacketing on piping, vessels, and equipment.

6.2.6.2 Metal Jacketing

Metal jacketing shall be aluminum with a factory applied moisture barrier of 0.015 mm minimum epoxy. SS 304 metal jacketing shall be used in areas subject to fire exposure.

For piping, jacketing shall be factory rolled, minimum 0.5 mm thick, field cut to proper length. In areas where the piping may be walked on or otherwise damaged, jacketing shall be minimum 0.6 mm thick.

For fittings, flanges, valves, and unions, jacketing shall be factory formed, minimum 0.5 mm thick.

For horizontal vessels less than 610 mm O.D., jacketing shall be minimum 0.5 mm thick. Between 610 mm and 2438 mm O.D., jacketing shall be minimum 0.6 mm thick and 0.8 mm thick for vessels larger than 2438 mm O.D.

For vertical vessels only, 0.5 mm thick x 32 mm (pitch) x 6 mm (depth) corrugated aluminum shall be used provided wind loads have been allowed.

6.3 INSULATION THICKNESS

The insulation thickness shall be based on Annexure-I. Insulation thickness shown in the Charts shall be the thickness of insulating slabs or preformed sectional pipe insulation and does not include the vapor barrier or final covering material.

7. APPLICATION OF HOT SERVICE INSULATION

7.1 GENERAL

Insulation materials shall be as shown on Annexure-II with thicknesses in accordance with Annexure-I. If the thermal conductivity of the selected insulation material is higher than that used for the development of Annexure-I, the chart will be recalculated.

All insulation shall be applied in full lengths where possible and joints shall be tightly butted. Ragged and open joints shall be neatly cut to fit flush.

Provision for the expansion of hot equipment shall include the installation of expansion springs in circumferential banding securing insulation and jacketing.

Engine exhausts operating above 300°C, or where specified by COMPANY, shall be covered with expanded metal shrouding secured to steel rings to provide an air space between exhaust pipe and jacket. If specified, 50 mm thick calcium silicate insulation shall be installed over the rings prior to cladding.

7.2 HOT PIPING

Factory fabricated sectional pipe insulation shall be applied in staggered joint construction and secured with wire loops or bands on 225 mm centers. On multiple layer construction, all joints shall be lapped one-half of each section between layers. Each layer shall be secured separately. All joints shall be securely butted and all cracks, joints, etc., shall be filled with insulating cement or glass Fiber as appropriate.

Mastic sealer shall be used around pipe supports where the insulation is punctured by the support.

Heat traced lines shall be insulated so as to completely cover both line and tracing.

Insulation shall be covered with metal jacketing lapped a minimum of 50 mm on all seams and secured with screws and bands, locating one band at each lap joint and spaced a maximum of 450 mm on center. Vertical jacketing shall be supported with "S" clips.

7.3 FITTINGS, FLANGES, AND VALVES

Valves, flanges and unions shall not normally be insulated unless specified by COMPANY. All other fittings are to be insulated.

Fittings shall be insulated with standard factory formed insulation and secured with wire loops or bands, minimum two per section. All joints shall be filled with insulating cement or glass Fiber as appropriate. Insulation shall be covered with factory formed standard metal jacketing.

Jacketing on valves, flanges and unions shall be installed so as to be removable without damage to the main pipe insulation.

7.4 VESSELS AND EQUIPMENT

7.4.1 Vessel

Vessels shells shall be insulated with factory fabricated insulation curved or grooved to fit the vessel shell contour. If additional layers are required, insulation shall be installed with staggered joints. Each layer shall be secured with bands; machine stretched, and fastened on 300 mm centers. All cracks or voids shall be filled with insulating cement. Insulation shall be covered with metal jacketing lapped a minimum 75 mm on all seams. Jacketing shall be secured with metal screws on 150 mm centers on longitudinal seams and with bands, located at lap and spaced on a maximum of 450 mm on center.

Vessel heads shall be insulated in the same manner as the shell. Insulation shall be covered with metal jacketing in a pie shaped or segmented arrangement.

Corrugated jacketing on vertical vessels shall be installed using the "S" clip method and lapped a minimum of two (2) corrugations on vertical seams.

For vessels up to and including 900 mm O.D., jacketing shall be secured using plain bands. For vessels greater than 900 mm O.D., banding shall be sealed.

Expansion joints shall be provided under each insulation support ring. A 25 mm space between the top of the insulation and the underside of the support ring shall be filled with mineral wool insulation.

A band shall be placed adjacent to heads of horizontal vessels and at the top sheet on vertical vessels to secure flashing between head and shell jackets.

Vessel skirts, saddle supports, bottom heads, and flanged connections shall not normally be insulated unless specified by COMPANY.

Insulation and jacketing on exchanger flanges and heads shall be installed so as to be removable without damage to the main shell insulation.

7.4.2 Equipment

Whenever possible, for equipment of irregular shape, insulation shall be of the same type and thickness as specified for vessels. Insulation and metal jacketing shall be installed so as to be removable.

Insulating cement, where required shall be applied in layers less than 20 to 25mm thick. Every layer shall be reinforced with steel mesh. The outer surface of the insulating cement shall be finished with a smooth layer of finish cement.

8. PERSONNEL PROTECTION - CLASS 'PP'

Insulation for personnel protection shall be provided on all piping and equipment adjacent to work platforms or other operating areas where the maximum operating temperature exceeds 65°C.

Insulation of piping for personnel protection shall be limited to the pipe and pipe fittings excluding flanges and valves. Insulation for personnel protection is not required where screens are to be installed for this purpose.

Insulation shall be in accordance with Section 7.0 with the exception of the insulation thickness which shall be in accordance with Annexure-I.

9. APPLICATION OF COLD SERVICE INSULATION

9.1 GENERAL

Cold insulation shall be installed specifically in accordance with the Manufacturer's recommendations, and generally as outlined below.

All surfaces requiring cold insulation shall be primed with rust inhibiting paint or coating as specified by the insulation manufacturer.

All gauge glasses, column, level controllers, thermo wells, etc., shall be fully insulated.

Saddles, skirts, and supports for piping and equipment shall be insulated to a depth of five (5) times the shell insulation thickness, with the same type and thickness of insulation as used on the piping and equipment.

9.2 PIPING

Factory fabricated sectional pipe insulation shall be applied in staggered joint construction. On multiple layer construction, all joints shall be lapped one-half of each section between layers such that all joints are staggered. In the top layer, all joints shall be buttered with sealant and fastened in place with bands using two per section or on a maximum of 450mm centers. The insulation is to be liberally covered with vapor barrier prior to being covered with metal jacketing lapped a minimum of 50mm on all seams.

Jacketing shall be secured with bands, located at each lap joint and spaced a maximum of 300mm on center. Vertical jacketing shall be supported with "S" clips (0.5 mm x 12 mm type 304 stainless steel).

All support lugs or stiffening rings on piping shall be fully insulated.

9.3 FITTINGS, FLANGES AND VALVES

All fittings are to be insulated with standard factory formed insulation. All joints shall be buttered and sealed. Insulation shall be secured with wire loops or bands with not less than four (4) loops or bands per fitting. Insulation shall be covered with standard factory formed metal jacketing.

Flanges, valves and unions shall be insulated with standard factory formed insulation and covered with standard factory formed jacketing.

9.4 VESSELS AND EQUIPMENT

9.4.1 Vessels

Vessels shells shall be insulated with factory fabricated insulation curved or cut to fit the vessel contour. The face of the insulation shall be covered with adhesive and applied while tacky. Joints shall be buttered with joint sealant. Insulation shall be secured using two (2) bands per course of insulation. The insulation shall then be liberally covered with vapor barrier prior to being covered with metal jacketing lapped 75 mm on all seams and secured with bands located at lap and spaced on a maximum of 450 mm centers.

In the event multiple layers of insulation are used, they are to be applied in the same manner as the first layer. Special care shall be taken so that all joints are staggered between layers.

Vessel heads shall be insulated in the same manner as the shell. Insulation shall be covered with metal jacketing in a pie shaped or segmented arrangement.

Corrugated jacketing on vertical vessels shall be installed using "S" clip method (using 0.5 mm x 12 mm type 304 stainless steel clips) and lapped a minimum of two (2) corrugations on vertical seams.

For vessels up to and including 900mm O.D., jacketing shall be secured using plain bands. For vessels greater than 900mm O.D., banding shall be sealed.

All nozzles and manway covers shall be insulated with the same thickness of insulation as on the main shell of the vessel. Insulation and jacketing at manway covers and flanges shall be installed so as to be removable without damage to the main shell insulation.

Vessel supports shall be insulated along the support to not less than four (4) times the shell insulation thickness.

Vessel support lugs and stiffening rings shall be fully insulated.

9.4.2 Equipment

Pump cases shall be insulated using factory formed or pre-cut insulation. All joints shall be buttered with joint sealant. Insulation shall be secured with wire or bands and finished with two (2) coats of weather barrier with reinforcing Fiber between coats.

Jacketing shall be in accordance with the requirements for flanges, valves and unions.

10. DOCUMENT AND DATA SUBMITTAL REQUIREMENT

10.1 GENERAL

The Contractor/Vendor shall submit documentation and data in accordance with the requirements of the Contract/Purchase Order.

Prior to the commencement of Work, the Contractor shall submit full details of each insulation system to the Company for approval, including description of materials, manufacturer's data, application, material safety datasheets etc.

Specific documentation covering Work procedures, inspection, tests, methods of surface preparation, coating materials and application, shall be provided in accordance with the applicable Sections of this Specification.

10.2 DOCUMENTATION OF WORK

Prior to commencement of Work the Application Contractor shall submit a sample Insulation Inspection Report form for approval. The Insulation Inspection Report must be countersigned by the Contractor's Representative and the Company's nominated Representative.

11. GUARANTEE

The Contractor shall guarantee the installation to be free from material defect, misapplication, or poor workmanship for a period of one (1) year after date of acceptance. Any unsatisfactory work or defects shall be repaired at Contractor's expense and at a time acceptable to COMPANY.

12. QA/QC REQUIREMENTS

All work shall be subject to the supervision, control and acceptance of the Company in the light of relevant specifications and scope of work. The contractor shall submit to the Company details of the manufacturers' proposed QA/QC program for approval.

The program shall cover such points as:

- Control of procurement and supplies
- Control of insulation manufacture
- Control of correct installation methods
and procedures on site

The manufacture and installation shall be carried out as per the applicable codes and standards of this Specification. The Company shall have free access at all reasonable times to carry out inspections at the contractor's or their supplier's factories to satisfy themselves that the agreed QA/QC procedures are being followed.

Annexure-I: Minimum Insulation Thickness [Mineral Wool] for Hot Service and Personnel Protection

NPS (DN)	PROCESS				PERSONNEL PROTECTION		
	Maximum Operating Temp (^o C) Range						
	120 and Below	121 To 200	201 to 260	261 to 315	100 to 150	151 to 200	201 to 300
Minimum Insulation Thickness (mm)							
1½ (40) and less	25	25	25	50	25	25	50
2 (50)	25	25	50	50	25	25	50
3 (80)	25	50	50	50	25	25	50
4 (100)	25	50	50	50	25	25	50
6 (150)	25	50	50	75	25	40	65
8 (200)	50	75	75	75	25	40	65
10 (250)	50	75	75	75	25	40	75
12 (300)	50	75	75	75	25	40	75
14 (350)	50	75	75	75	40	50	90
16 (400)	50	75	75	75	40	50	90
18 (450)	50	75	75	100	40	50	90
20 (500)	50	75	75	100	40	50	90
22 (550)	50	75	75	100	40	50	90
24 (600)	50	75	75	100	40	50	100
Tanks, Vessels & Equipment	50	75	75	100	40	50	100

Notes:

- The above tables are based on Fibertex 350 insulating material having nominal density 60 kg/ m³ and approximate thermal conductivity value of 0.043 W/m K at 100°C (mean).
- The above tables do not include the insulation effect of final coverings, which can be expected to further reduce insulation surface temperatures.
- Insulation for heat conservation above 260°C and/or where insulation thickness required exceeds 65mm shall be applied in double or multi-layer construction.
- Hot accessible surfaces should be shielded by means of mesh or perforated plate. Insulation to be used only where shielding is not practical.

Annexure-II: INSULATION AND COATING MATERIALS

Typical hot insulation products are listed below.

Manufacturer	Type of Material	Product
Bradford Insulation	Mineral Glass-wool blanket insulation	Flexitel blanket 24kg/m3
Bradford Insulation ACI Insulation	Mineral Glass-wool pipe insulation	Glass-wool SPI 80 kg/m3 Heatlock SPI 80 kg/m3
Bradford Insulation Lapinus	Preformed (moulded) Mineral Rockwool pipe sections	Rockwool Fibertex 350, SPI 450 or 650, 140 to 160 and 180 to 200 kg/m ³ respectively Rockwool 130 kg/m3
Bradford Insulation Lapinus	Mineral Rockwool blankets and slabs	Fibertex and Fibremesh 350, 450 and 650 60, 80, 100 kg/m3
Dow Corning	Silicon Sealant	780
Roberts	Self-setting cement	Spray fibre BD6
Fosters	Joint sealant	Flextra 95-50

Equivalent or better available products may be proposed by the Vendor (along with detailed comparison of properties of all proposed options and product as listed above) for approval by the company.

APPENDIX-A3



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR PAINTING

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1. GENERAL

1.1 Scope

This specification covers the minimum requirements for the selection, supply and application of the painting system to be used on the external surfaces of pipeline, process plant, tanks, buildings and production facilities, including structural steel, piping, equipment, internal surface of storage tanks and its structure. This specification is applicable to both shop and field/site painting works.

The painting works to be performed shall include all supply of painting material, material required for application of painting, surface preparation, protection of other works, application of primer, intermediate and top coat, repair of damages to painting works cleaning of the working area as well as all intermediate and final inspection works.

The following surfaces are not required to be coated:

- Nonferrous materials (stainless steels, aluminum, etc.) unless specifically required.
- Plastic or plastic-coated materials not susceptible to ultra-violet deterioration.

Machined and threaded surfaces shall be protected with a temporary rust preventative.

Any deviation from this specification shall be approved in writing by the COMPANY. Failure of CONTRACTOR to consult with the COMPANY to clarify any item in the specification will, in no way, relieve the CONTRACTOR of his responsibility of satisfactory compliance with these specifications.

1.2 Definitions

COMPANY / OWNER	OIL & GAS DEVELOPMENT COMPANY LTD. (OGDCL)
CONSULTANT:	PETROCHEMICAL ENGINEERING CONSULTANTS (PEC)
CONTRACTOR:	"CONTRACTOR" means the person or persons, firm or Proprietor, whose proposal, has been accepted by the COMPANY for construction, installation / erection, testing and completion of all works as mentioned in the SOW

1.3 Errors or Omissions

The review and comment by the COMPANY of any CONTRACTOR's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the CONTRACTOR of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

Any errors or omissions noted by the CONTRACTOR in this Specification shall be immediately brought to the attention of the COMPANY.

1.4 Deviations

All deviations to this Specification, other related specifications or attachments shall be brought to the knowledge of the COMPANY in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection of the Works shall be with written approval of the COMPANY prior to execution of work. Such deviations shall be shown in the documentation prepared by the CONTRACTOR.

1.5 Conflicting Requirements

In the event of any conflict, inconsistency or ambiguity between the Contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the CONTRACTOR shall refer to the COMPANY whose decision shall prevail.

1.6 Work Procedure

1.6.1 General

The CONTRACTOR shall submit for approval to the COMPANY detailed procedures for:

- Surface cleaning
- Paint material storage and preparation procedure
- Primer application
- Intermediate and finish coat application
- Inspection and data recording procedures
- Paint repair procedure
- Painted equipment/material transportation, storage and handling procedure
- Type of abrasive to be used

The above procedure shall include the application equipment/tools. All procedures shall meet the minimum requirement stated in this specification.

Material specification for the cleaning and painting, and mixing materials, shall be sub-mitted to the COMPANY for approval. Detailed manufacturers data shall be submitted with these specifications. Material shall not be procured prior to approval of the COMPANY.

Work shall be done by qualified & experienced personnel in a neat and workman like manner conforming to all Applicable specification and standards. CONTRACTOR shall carry out the qualification test prior to the commencement of actual work.

1.6.2 ATMOSHPERIC CONDITION

CONTRACTOR shall ensure the recording of ambient condition at regular intervals prior to and during of blasting / Painting / Coating application. Surface temperature, ambient temperature, dew Point and humidity shall be recorded and documented during the operation. No Blasting and Painting activity shall be permitted when:

- Humidity is higher than 80%
- Surface Temperature is 3 C or above the dew Point.
- Surface Temperature is above 50 C

2. CODES, STANDARDS & SPECIFICATIONS

The codes and rules to be taken into consideration are:

- The SSPC (Steel Structures Painting Council)
 - Volume 1: good painting practice
 - Volume 2: systems and specifications
- The SIS 05 59 00

Swedish standard- Pictorial surface preparation Standards for painting steel surface

3. SURFACE PREPARATION

All rough welds, burrs, weld spatter, indentations and all other sharp surface projections shall be ground smooth prior to further surface preparation. Any grinding done after blast cleaning to obtain proper anchor pattern, grinding is forbidden on piping systems.

All bolt holes shall be drilled and smoothed before blast cleaning. All surfaces to be coated shall be blast cleaned to:

- SSPC-SP 10 "Near white blast cleaning" per Steel Structures Painting Council (SSPC) surface preparation specification SP-10-63T or
- S.A. 2.5 of Swedish Standards Institution SIS 05 5900.

All surfaces shall be blast cleaned to achieve surface profile of $\frac{1}{3}$ of total paint film thickness in microns. Material used for blast cleaning shall be submitted to the COMPANY for approval. COMPANY will have the right to select most appropriate material. CONTRACTOR shall provide a surface profile meter at site for the inspection of achieved surface profile.

Any oil, grease, dust or foreign matter deposited on the surface after the surface preparation is completed shall be removed prior to painting. In the event rusting occurs after completion of surface preparation, the surfaces shall again be cleaned in accordance with the specified method.

Cleaning shall be discontinued each day in sufficient time to permit the surfaces cleaned to be primed before the end of the working day.

Dry blast cleaning operations shall not be conducted on surfaces that will be wet after blasting and before painting. If relative humidity is greater than 80%, permission to blast shall be obtained from COMPANY.

Extreme care shall be exercised to prevent damage when blasting near nameplates, machined surfaces and factory-coated items, Raised face of flanges. These surfaces shall be adequately protected.

Mill scales, rust scales, old paints marking, slags and sediments, weld spatter and other foreign materials shall be thoroughly removed.

Cloth is not allowed to be used on blasted surfaces for cleaning the sand dust which accumulated due to blasting operation, soft brush shall be used for the purpose.

Blasted and cleaned surfaces shall be inspected and approved by the COMPANY, prior to priming/painting works.

Sand particle size and abrasive contamination shall be regularly checked.

The abrasive for blasting shall be dry and free from oil, grease, dust and other impurities. Re-usable abrasive shall be clean and reasonably sharp, contain no rust or noticeably worn abrasives.

Blast Cleaning shall not be permitted where adjacent area or equipment are not sufficiently protected from contamination by abrasive dust or debris.

Blast Cleaning shall not be permitted in the areas close to the painting operation to prevent contamination of wet paint film by dust and grit.

4. PAINT MIXING, THINNING & STORAGE

All containers of coating material shall remain unopened until required for use and shall be stored under cover. Painting materials shall be stored in accordance with the instructions of the paint manufacturer.

Painting material which has jelled or otherwise deteriorated during storage shall not be used.

All ingredients in any container shall be thoroughly mixed before use to a smooth and uniform consistency. Mechanical agitation during application shall be sufficient to keep pigment in solution.

Painting material mixed in the original container shall not be transferred until all settled pigment is incorporated in the vehicle. This does not imply that part of the vehicle may not be poured off temporarily to simplify the mixing.

Painting material shall not be mixed to keep in suspension by using a bubbling air stream.

Where a skin has formed in the container, the skin shall be cut loose and discarded. If such skins are sufficiently thick to have a practical effect on the composition and quality, the paint shall not be used.

All pigmented material shall be strained after mixing except where application equipment is provided with adequate strainers. Strainers shall be capable of passing the pigment and removing any skin.

Painting material which does not have a limited life or does not deteriorate on standing may be mixed any time before using and shall not remain in spray pots or buckets overnight, but shall be gathered in to a closed container and remixed before use.

No thinner shall be added unless necessary for proper application. Thinning shall not exceed limitations established by Manufacturer.

Type of thinner shall comply with Manufacturer's instructions.

When use of thinner is permissible, it shall be added during the mixing process. Painters shall not add thinner after it has been thinned to the proper consistency. All thinning shall be done under supervision of someone acquainted with the correct amount and type to be added.

All painting materials shall have prior approval of the COMPANY.

5. COATING PROCEDURE

5.1 Ferrous Structures and Equipment

5.1.1 Painting System

The type of paint, number of coats and thickness shall be applied as outlined in Sections-7.1 to 7.7 other painting materials can be used only with COMPANY's prior approval.

Primers and finish coats for any particular system shall be from the same manufacturer to ensure material compatibility.

Manufacturer's instructions, including safety precautions, are a part of this specification. In case of conflict, the manufacturer's mandatory instructions shall govern.

5.1.2 Application

Surfaces shall not be painted in rain, wind, snow, fog or mist in areas where injurious airborne elements exist, when the steel surface temperature is less than 3°C above dew-point, when the relative humidity is greater than 80% or when the temperature is below 5°C.

To the maximum extent practical, each coat of material shall be applied as a continuous film of uniform thickness free of pores. Any thin spots or areas missed in the application shall be recoated and permitted to dry before the next coat is applied.

Each coat shall be in a proper state of cure or dryness before the application of the succeeding coat. Material shall be considered dry for re-coating when an additional coat can be applied without the development of any detrimental film irregularities such as lifting or loss of adhesion of the undercoat.

When successive coats of the same color have been specified, alternate coats shall be tinted when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface.

When the material is the color of the steel or when the tinting of the final coat is objectionable, the first coat to be applied shall be tinted. The tinting material shall be compatible with the material and not detrimental to its service life.

All blast cleaned surfaces shall be coated with the specified primer within four hours after blasting, before rusting occurs. No acid washes or other cleaning solutions or solvents shall be used on metal surfaces after they are blasted.

Brush application of paint shall be in accordance with the following:

- Brush application shall be done in areas which cannot be properly sprayed and for touch up maintenance where spray application is not practical
- Brushes shall be of a style and quality that will enable proper application of paint. Round or oval brushes are most suitable for rivets, bolts, irregular surfaces and rough or pitted steel, wide, flat brushes are suitable for large flat areas, but they shall not have a width over 125 millimeters.
- The brushing shall be done so that a smooth coat as nearly uniform in thickness as possible is obtained.
- Paint shall be worked into all corners.
- Any runs or sags shall be brushed out.
- There shall be a minimum of brush marks left in the applied paint.
- Surfaces not accessible to brushes shall be painted by spray, daubers or sheepskin.

Roller application of paint could also be used. Rollers of different length of maps should be selected as per the requirement.

Airless spray application shall be in accordance with the following:

- The equipment used shall be suitable for the intended purpose and shall be capable of properly atomizing the paint to be applied. The nozzles shall be those recommended by the Manufacturer of the equipment for the material being sprayed. The equipment shall be kept in satisfactory condition to permit proper paint application.
- Most suitable spray tip and pressure should be selected and used.
- The spray fan should be kept at right angle to the surface and the gun should be triggered off at the end of each pass.

- Proper distance should be maintained for holding an airless spray gun from the surface being coated, in order to avoid pin holing, dry spraying and over-spraying.
- When in use, avoid placing hands or fingers in front of the gun, as contact with the pressurized point can cause serious injury.
- Spray trigger-locking device should be in working order and only released during spraying operation.
- Spray equipment shall be kept sufficiently clean so that dirt, dried paint and other foreign materials are not deposited in the paint film. Any solvents left in the spray equipment shall be completely removed before applying paint to the surfaces being painted.
- Airless Paint spray equipment shall always be provided with an electric ground wire in the high pressure line between the gun and the pumping equipment. Further the pumping equipment shall be suitably grounded to avoid the buildup of any electrostatic charge on the gun. The manufacturer's recommendation should be followed regarding the proper use of the equipment
- Paint shall be applied in a uniform layer with overlapping at the edge of the spray pattern. The spray pattern shall be adjusted so that the paint is deposited uniformly.
- Areas inaccessible to the spray gun shall be painted by brush; if not accessible by brush, daubers or sheepskins shall be used. Brushes shall be used to work paint into cracks, crevices and blind spots which are not adequately painted by spray.
- Particular precautions are necessary in spraying inorganic zinc.

All nameplates, manufacturer's identification tags, machined surfaces, instrument glass, finished flange faces, control valve stems and similar items shall be masked to prohibit coating deposition. If these surfaces are coated, the component shall be cleaned and restored to its original condition.

Edges of structural shapes and irregular coated surfaces shall be coated first and an extra full pass made later.

Contact surfaces of all components (bottom of skids, mounting surfaces of equipment etc.) are included in the scope of work to be coated.

Wet paint shall be protected against contamination from dust or other foreign matter.

Sand blasting yard and painting yard shall be appropriately apart or if close shall be segregated by a proper partition.

Second primer coat and finish coats, as specified, shall be applied after fabrication, erection and welding activities.

5.1.3 Drying of Coated Surfaces

No coat shall be applied until the preceding coat has dried. The material shall be considered dry for recoating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion to under coats and the drying time of the applied coat does not exceed the maximum specified for it as a first coat.

No paint shall be forced dried under conditions which will cause checking wrinkling, blistering, formation of pores or detrimentally affect the condition of the paint.

No drier shall be added to paint on the job unless specifically called for in the manufacturer's specification for the paint.

Paint shall be protected from rain, condensation, contamination, snow and freezing until dry to the fullest extent practical.

5.1.4 Repair of Damaged Paint Surface

Where shop paint has been damaged in handling, all damaged and loosely adhering paint shall be removed and the surface thoroughly cleaned. Edges of the breaks shall be feathered and the designated number of prime and finish coats applied.

5.2 Non-Ferrous Structures and Facilities

5.2.1 Coating System

The surface painting of the non-ferrous structures shall be carried out after the surface preparation has been performed in a proper way and accepted by the COMPANY.

The surface painting consists of two separate coats, primer coat and final coat which shall be applied and after drying of the primer coat.

6. INSPECTION

The CONTRACTOR shall deploy a qualified team for the Quality Control of the painting Works. Detailed QC procedures shall be developed by the CONTRACTOR and submitted to the COMPANY for approval. All painting Works shall be carried out only in accordance with the approved procedure.

All materials supplied and Works performed under this specification shall be subject to inspection by inspectors nominated by the COMPANY.

All parts of the work shall be readily accessible to the inspector.

Approval of each of the following shall be obtained before proceeding with any subsequent phase:

- Weather Conditions
- Location of work
- Surface Preparation and painting of Equipment and Material
- First coat
- Each subsequent coat

The COMPANY shall have the authority to reject any Work that does not conform to the specifications. Applicator shall correct work found defective under this specification.

The painting work inspection shall be undertaken in five (5) steps according to the hereunder sequence:





- The blast cleaning required grade shall be checked by means of pictorial surface standards. The surface cleanliness, result of the surface preparation.
- An in-process checking will be given to check the wet film thickness by means of the wet film thickness gauge.
- After coating, the dry film thickness shall be measured by means of an Elcometer. In case minimum dry film thickness as specified in this specification are not achieved due to whatever reasons, the number of coats will be increased accordingly to achieve the only specified DFT.
- The coating integrity testing will be achieved by the use of a holiday detector. In case of lack of paint detection, the CONTRACTOR shall mark the holiday to indicate the location of repair work to be performed.

All equipment necessary to measure the performance of painting shall be provided by the CONTRACTOR.

CONTRACTOR shall perform adhesion test as per ISO-2409 by cross cut test method to determine the bonding strength between applied paint / Coating and substrates where the paint was applied.

CONTRACTOR to examine the cut area of the test coating in good lighting, using normal or corrected vision or if agreed between the interested parties, using a viewing lens. Classify the test area in accordance with Table 1.

Table 1 — Classification of test results

Classification	Description	Appearance of surface of cross-cut area from which flaking has occurred (Example for six parallel cuts)
0	The edges of the cuts are completely smooth; none of the squares of the lattice is detached.	—
1	Detachment of small flakes of the coating at the intersections of the cuts. A cross-cut area not greater than 5 % is affected.	
2	The coating has flaked along the edges and/or at the intersections of the cuts. A cross-cut area greater than 5 %, but not greater than 15 %, is affected.	
3	The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross-cut area greater than 15 %, but not greater than 35 %, is affected.	
4	The coating has flaked along the edges of the cuts in large ribbons and/or some squares have detached partly or wholly. A cross-cut area greater than 35 %, but not greater than 65 %, is affected.	
5	Any degree of flaking that cannot even be classified by classification 4.	—

The first three steps are satisfactory for general purposes and are to be used when a pass/fail assessment is required.

7. PAINTING SYSTEMS

The painting system to be applied for each type of equipment/structure and facilities shall be according to the system described hereunder. Color scheme shall be provided by the COMPANY. The CONTRACTOR shall check the dry film thicknesses by Elcometer in the presence of COMPANY.

7.1 Tank External Surfaces (Shell & Roof)

7.1.1 Tank shell

First Coat	Inorganic Zinc Silicate	40-50 microns DFT
Second Coat	Inorganic Zinc Silicate	40-50 microns DFT
Third Coat	Alkyd Enamel	20-25 microns DFT
Fourth Coat	Alkyd Enamel	20-25 microns DFT
Total Thickness		120 microns minimum 150 microns maximum

The color shall be 67% area in Clifton sand and 33% area in Camouflage green painted in a camouflage Pattern as approved by the COMPANY.

7.1.2 Tank Roof Surfaces

First Coat	Coal Tar epoxy(Black)	65-75 Microns
Second Coat	Coal Tar Epoxy (Brown)	65-75 Microns
Third Coat	Hi-Build Epoxy Finish	45-55 Microns
Fourth Coat	Hi-Build Epoxy Finish	45-55 Microns
Total Thickness		220 microns minimum 260 microns maximum

7.2 Tank Appurtenances

For all appurtenances, such as nozzles, manholes, staircase, handrail etc., the system given below shall be followed:

First Coat	Inorganic Zinc Silicate	40-50 microns DFT
Second Coat	Inorganic Zinc Silicate	40-50 microns DFT
Third Coat	Alkyd Enamel	20-25 microns DFT
Fourth Coat	Alkyd Enamel	20-25 microns DFT
Total Thickness		130 microns minimum 150 microns maximum

The color shall be Clifton sand (67%) and camouflage green (33%)

7.3 Tank Internal Surface

Topside of the bottom plates, and lower 2 meter of shell plate, and equal height of the internal piping/structure columns shall be painted as under:

First Coat	Epoxy Zinc Phosphate Primer	75-80 microns DFT
Second Coat	High Build Epoxy White	125-130 microns DFT
Third Coat	High Build Epoxy White	125-130 microns DFT
Total Thickness		325 microns minimum 340 microns maximum

7.4 Underside of the Tank Bottom Plates

First Coat	Coaltar Epoxy	75-80 microns DFT
Second Coat	Coaltar Epoxy	75-80 microns DFT
Third Coat	Coaltar Epoxy	75-80 microns DFT
Total Thickness		225-230 microns

7.5 Piping & Steel Structure

Primer Coat	Inorganic Zinc Silicate	1 Coat 40-50 microns DFT
Intermediate Coat	Amine or Polyamide Cured	1 Coat 125-130 microns DFT
Intermediate Coat	Micaceous Iron Oxide (MIO)	1 Coat 125-130 microns DFT
Finish Coat	Polly Urethane Enamel	1 Coat 40-50 microns DFT

Total Thickness	330-360 microns minimum
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7.6 Un-insulated Equipment

(Heat Exchangers, Air Fin Coolers, Vessels, Furnace etc. (Including external attachment) (up to 90°C))

Primer Coat	Red Lead Long Alkyd	1 Coat 35-40 microns DFT
Primer Coat	Red Lead Long Alkyd	1 Coat 35-40 microns DFT
Intermediate Coat	Alkyd Enamel or Aluminum Paint	1 Coat 20-25 microns DFT
Finish Coat	Alkyd Enamel or Aluminum Paint	1 Coat 20-25 microns DFT
Total Thickness		110-115 microns

(Buried Tanks & Piping up to 93°C)

Applicable to Materials	CS	
Surface Preparation	Sa2%	
Primer Coat	Polyurethane - Tar	750 microns
Finish Coat	Polyurethane	750 microns
Total Dry Film Thickness		1500 microns minimum

7.7 Un-insulated Equipment

(Heat Exchangers, Air Fin Coolers, Vessels, Furnace etc. (Including external attachment) (up to 91°C to 400°C))

Primer Coat	Inorganic Zinc Silicate Primer	1 Coat 50-55 microns DFT
Intermediate Coat	Heat Resisting Paint (Silicone Resin)	1 Coat 25 microns DFT
Finish Coat	Heat Resisting Paint (Silicone Resin)	1 Coat 25 microns DFT
Total Thickness		100 microns minimum

7.8 Cabinets and Instrument Panels

For carbon steel surfaces of cabinets and control panels, and for instrument and electrical equipment etc.

For Exterior surfaces of cabinets, panels, etc:

Type	Prime Coat Wash Primer	Intermediate & Finish Coats Aliphatic Polyurethane
Number of coats	1	2
DFT, microns/coat	15	25

For Interior Surface of cabinets, panels, etc.: same as exterior surfaces, but with only one finish coat.

7.9 Hot-dipped Galvanized Structures

Structural steel galvanized coating shall be per ASTM specification A-123, except coating weight in grams per square meter shall not average less than 700 grams (92.3 ounces per square foot); individual specimen shall show less than 615 grams (2.0 ounces).

Pipe galvanized coating shall be per ASTM A.120 or as specified above for structural steel. All cuttings, shaping and welding shall be done before galvanizing.

Any areas damaged in handling shall be cleaned and coated with galvoweld or equivalent product.

Galvanized component surfaces shall be degreased and sand swepted to remove surface film and provide an anchor pattern for paint before applying coating.

Material to be galvanized shall be cleaned of dirt oil and other contaminants that could interface with adherence of galvanized.

The dry film thickness of the galvanized surface shall be as follows:

Type	Prime Coat	Finish Coat
Number of coats	1	1
DFT Microns/coat	50	75

8. COLOUR SCHEDULE AND MARKING

Requirement for colors and marking for piping systems as vessels, tanks, structural steel and miscellaneous other items are described in this Section. Final colors scheme shall be selected by the COMPANY prior to painting of the equipment/system.

8.1 Definitions

8.1.1 Piping System

Piping systems shall include pipes of any kinds and, in addition, fittings valves and other miscellaneous devices involved in the piping field (not buried).

8.1.2 Tanks and Vessels

Tanks and vessels shall include all liquid containers, pressurized or not, vertical or horizontal, provided that they are not buried, and allowing storage of the different fluids handled for operational and safety purpose.

8.1.3 Structural Steel

Structural steel works shall include all platforms, gangway, ladders, safety cages, building structures, as well as skids, supports, etc. foreseen for access and/or safety purposes and mechanical needs of the project.

It shall include all cranes, davits, overhead traveling cranes.

8.2 Method of Identification

8.2.1 Marking

Positive identification of the content of a piping systems or vessel tanks shall be by lettered and numbered legend. Arrows shall be used to indicate direction of flow. The identification of piping marking shall refer to the line number shown in the P&ID.

The content of vessels and tanks shall be indicated. P&ID and the tank or vessel identification number shall be painted at a prominently visible location. Depending on the size of the tanks, two to four markings shall be required, at equal distance on the circumference.

Marking shall be applied close to valves and adjacent to changes in direction, branches and where the pipes pass through walls floors, and at frequent intervals on straight pipe runs. Not less than (5) five meters.

8.2.2 Color Coding

Color coding shall be applied as per Annexure-A of the document herein.

8.2.3 Visibility

Attention shall be given to visibility with reference to pipe markings. Where the pipes are located above or under the normal line of vision, the marking shall be placed above or under the pipe centerlines.

8.2.4 Type and Size of Markings

1) General

Maximum contrast shall be provided between color field and markings for readability. The enclosed color schedule gives the requirements for piping and equipment painting. The stripes or bands foreseen for the marking of piping system shall not interfere with the pipe marking.

2) Size of Letter and Numbers

Unless specifically indicted by the material particular specification, the size of marking letters and numbers will be as follows:

Outside Diameter of Pipe or Equipment	Size of Letters and Numbers
¾" to 1¼" (19 to 32mm)	15mm
1½" to 2" (38 to 61mm)	20mm
3" to 6" (90 to 170mm)	35mm
8" to 10" (22 to 275mm)	65mm
12" to 16" (320 to 410mm)	90mm
18" to 24" (455 to 610mm)	100mm
Over 24" (over 610mm)	150mm for piping 200mm for equipment

9. LABOR AND SAFETY

9.1 Labor

All steps pertaining to painting works shall only be performed by skilled personnel duly qualified to do so. The CONTRACTOR shall have its own supervision personnel working in relation with the COMPANY's quality personnel.

9.2 Protection of Works

9.2.1 Works Under Progress

All necessary protection steps shall be taken to protect works under progress from dust and a sufficient supply of clean drop clothes shall be maintained. The CONTRACTOR shall lay such drop clothes in all areas where the painting works under progress are to be protected.

9.2.2 Other Works

The CONTRACTOR shall lay drop clothes in all areas where painting is being done, to protect floors, machinery and equipment as well as other work, from damage during the prosecution of painting works.

As a general rule, spilled paint should be cleaned up immediately.

9.3 Safety at Work

9.3.1 Personnel Safety

CONTRACTOR shall take all necessary safety measures for the personnel, equipment and material.

For personnel safety, special personal safety equipment shall be provided to the workers during the works. This will include but not limited to:

- Splash-proof goggles to be worn during chipping, wire brushing, sandblasting, spraying etc.
- Rubber gloves to be worn when using paint removers, acid treatment, cleaning compounds, etc.
- Safety belts when working inside tanks, on high equipment such as bridges, structural steel works, water towers, etc.
- Airline mask when sandblasting, spraying toxic products, etc.
- The CONTRACTOR shall provide required safety gears to COMPANY's personnel during the inspection of work.

9.3.2 Safety Equipment

1) Ladders

All extension and straight ladders should be equipped with safety shoes. All ladders shall be inspected once a month and the defective units shall be removed from the Site. No metal ladders are allowed to be used where electric cables or sources are installed.

It is reminded that neither piping nor equipment is to be used to support painters, ladders or scaffolding.

2) Swinging Stages and Scaffoldings

Swinging stages and scaffoldings shall always have a backrail. They shall be tested with twice the load they will be expected to bear in service. Provision shall be included in the back of the backrail for providing suitable support for all hand tools that may be used. All tools shall be kept in this support when not in use.

9.3.3 General Precautions

- When working around pulleys, gears, drive shafts, other moving parts, or inside tanks, fuses should be pulled or drive belts removed. Then working in any vessels, all lines coming to or leading from the vessel should be blanked or plugged.
- Overhead danger signs should be used when working near walkways, over doorways, platforms or roadways.
- Do not use paints containing a volatile solvent in enclosed areas where welders are at work.
- Use chemical type respirators when doing any spray painting except when in front of proper spray booth.
- Face shields should be worn when using power cleaning tools and chipping hammers.
- Wear rubber gloves when using spark tester for locating breaks or pores in coatings.
- Do not seal paint cans of ready-to-mix paints after they have been mixed. The materials are not stable when mixed. For temporary storage punch a hole in the lid.
- No lead base paint or primer should be used.

Annexure-A: Color Coding

Piping

Service shall be indicated by colour banding applied to the finished paint system. The colours for each service are indicated below. Colour banding may be by painting or durable tape material. The proposed tape material shall be submitted to the COMPANY for approval.

Each colour band shall be 150mm wide and each set of bands shall be no greater than 4 metres and no less than 500mm apart. In addition, banding shall be applied at bulkheads, package and vessel termination points, pipe junctions and either side of each valve. Where two colour bands are required to indicate a service, a 400mm band of the first listed colour shall be applied with a secondary colour placed in the centre of the base colour band.

Service Codes		P&ID Service Code	BS4800 Colour Code
AC	COMBUSTION AIR	YELLOW WHITE BANDS	10E53 00E55
AI	INSTRUMENT AIR	LIGHT BLUE WHITE BANDS	20E51 00E55
AM	AMINE	VIOLET YELLOW BANDS	22D45 06E51
AP	PLANT AIR	BLUE	20E51
CI	CHEMICAL INJECTION	VIOLET GREEN BANDS	22D45 14E51
CO	CARBON DIOXIDE	LIGHT BLUE BROWN BANDS	20E51 06C39
DC	CLOSED DRAIN	BLACK BROWN BANDS	00E53 06C39
DO	OPEN DRAIN	BLACK	00E53
EX	EXHAUST (DIESEL ENGINE)	BROWN WHITE BANDS	06C39 00E55
FG	FUEL GAS	YELLOW WHITE BANDS	10E53 00E55
FM	CO2 EXTINGUISHING GAS	VIOLET BLUE BANDS	22D45 20E51
FO	DIESEL FUEL	BROWN YELLOW BANDS	06C39 10E53
FP	DRY POWDER FIRE SYSTEM	YELLOW ORANGE BANDS	10E53 06E51
GI	INERT GAS	LIGHT BLUE YELLOW BANDS	20E51 10E53
GL	GLYCOL	VIOLET WHITE BANDS	22D45 00E55
HO	HYDRAULIC OIL (NOT SS TUBING)	BROWN BLUE BANDS	06C39 18E53

LO	LUBE OIL	BROWN ORANGE BANDS	06C39 06E51
ME	METHANOL	VIOLET	22D45
PG	PROCESS GAS	YELLOW	10E53
PL	PROCESS LIQUIDS	BROWN	06C39
PT	PROCESS FLUID-TWO PHASE	YELLOW BROWN BANDS	10E53 06C39
SO	SEAL OIL	BROWN ORANGE BANDS	06C39 06E51
VA	ATMOSPHERIC VENT	BLACK	00E53
VH	HIGH PRESSURE VENT/FLARE	ORANGE	06E51
VL	LOW PRESSURE VENT/FLARE	ORANGE BROWN BANDS	06E51 06C39
WC	COOLING MEDIUM	BROWN VIOLET BANDS	06C39 22D45
WD	POTABLE WATER	LIGHT GREEN	12E53
WF	FIRE WATER (WHOLE PIPE)	RED	04E53
WG	SEWAGE	BLACK ORANGE BANDS	00E53 06E51
WH	HEATING MEDIUM	GREEN BROWN BANDS	14E51 06C39
WP	PRODUCED WATER	BLACK BLUE BANDS	00E53 18E53
WR	RAW WATER	GREEN	14E51
WS	SERVICE WATER	GREEN WHITE BANDS	14E51 00E55
WW	WASTE WATER	BLACK GREEN BANDS	00E53 14E51

Structural

Struture	Colour	BS4800 Colour Code
Structural Steel work (Painted)	Off-White	00A01
Structural Steelwork Natural (Galvanised)	-	Natural
Handrails, Ladder, Cages, Escape Route Boundaries	Yellow	10E53
Grating	Galvanised	Natural
Overhead Obstructions	Yellow with black stripes	10E53/00E53

Mechanical Equipment

Equipment	Colour Off-White	BS4800 Colour Code
Vessels (General)	Off-White	00A01
Tanks	Off-White	00A01
Turbines, Pumps, Compressors	Manufacturer's Standard	
Engines	Manufacturer's Standard	
Shell and Tube Heat Exchangers	Off-White	00A01
Air Compressors	Manufacturer's Standard	
Minor equipment	Manufacturer's Standard	
Fire Fighting	Red	04E53

APPENDIX-A4



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR PRESSURE TESTING OF PIPING SYSTEM

DOC. NO: 0504196-MEC-SP-004

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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Disclaimer

This Specification has been prepared on behalf of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and for the exclusive use of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and is subject to and issued in accordance with the agreement between Petrochemical Engineering Consultants (PEC) and OGDCL. PEC accept no liability or responsibility whatsoever for it in respect of any use of or reliance upon this Specification by any third party.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	AV	SAR	Adeel	Jan 19 th , 2021		

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1. DEFINITIONS

Company	OIL & GAS DEVELOPMENT COMPANY LIMITED (OGDCL)
Consultant	PETROCHEMICAL ENGINEERING CONSULTANTS (PEC)
Contractor	The person or persons, firm or Proprietor, whose proposal, has been accepted By the COMPANY for construction, installation / erection, testing and Completion as of works mentioned in the SOW
Vendor	Organization which produces and/or supplies items (material, equipment etc.) and/or services to carry out the duties as specified by the Company.
May / Can	Indicates a recommendation
Shall	Indicates a mandatory requirement
Should	Indicates a strong recommendation (require justification if not followed)

2. INTENTION

The intent of this document is to describe the minimum acceptable parameters/requirements for the **Pressure Testing**. The Contractor / Vendor / Supplier etc. shall review these in the light of latest edition/version/revision/issuance/publication of all applicable National and/or International Rules, Regulations, Laws, Ordinance, Recommended Practices, Design Standards, Guidelines, Best/Good Engineering Practices, Government Notifications, etc. If any requirements are not found/stated in this document, or found but are less conservative/stringent, the most conservative/stringent requirements shall be followed without any negative cost, schedule, quality and scope impact to the Company.

3. ERROR OF OMISSION

The review and comments by Company / Company representative shall only indicate acceptance of general requirements and shall not relieve the Contractor / Vendor / Supplier etc. of its obligations to comply with the requirements of this document and other referred documents.

4. CONFLICTING REQUIREMENTS

In case of any sort of conflicts, inconsistencies or ambiguities, the Contractor / Vendor / Supplier etc. shall inform the Company in writing, seek clarifications and resolve the conflict. The Company decision shall be considered final.

5. SCOPE

This specification covers the requirements upon completion of fabrication and erection. Each piping system shall be pressure tested by the Contractor to ensure the integrity of weldments and materials affected by the welding processes. It also covers system testing of piping with other connected equipment.

6. CODES AND STANDARDS

All codes, standards, specifications and other documents shall be the latest and company approved (where applicable) issue on the date of purchase order and it shall be the Contractor's / Vendor's / Supplier's responsibility to comply with the same.

Contractor shall meet or exceed the requirements of the latest edition of ASME B31.3 code.

7. GENERAL REQUIREMENTS

7.1 PREPARATION FOR PRESSURE TESTING

7.1.1 General

An approved test procedure shall be made available at the site prior to commencing any pressure testing activities.

All vessels, tanks and equipment shall be cleaned by sweeping/brushing out loose debris and flushing with test medium.

New piping systems with pipes sizes up to NPS 12 shall be flushed clean of loose scale and debris or scraped prior to commencement of pressure testing. Care shall be exercised to ensure all pipe spools are internally clean before installation. New piping systems with pipe sizes of NPS 14 and larger, the following procedures shall be used for internal cleaning of the individual piping spools:

- The internal cleaning shall be performed by air blowing and rag cleaning of individual piping spool prior to commencement of pressure testing.
- At the end of each working day, the piping ends shall be covered after inspection.
- A method of covering the pipe end shall be generated by the Contractor to prevent unauthorized removal of the end cover prior to making the joint of the succeeding section of piping.

Components in new piping systems which interfere with filling, venting, draining or flushing shall not be installed until after line flushing and pressure testing are completed. These include orifice plates, flow nozzles, sight glasses, venturies, positive displacement and turbine meters and other in-line equipment. Soft seated valves and control valves shall not be installed until after the lines have been thoroughly flushed.

7.1.2 Equipment Excluded from Pressure Test

The following list defines the equipment that shall be excluded from the in-situ pressure testing of the tested system. Also, other unlisted sensitive equipment or as designated by Company can be added. Removed items shall be enclosed completely with plastic sheeting for protection during storage of the following:

- Rotating machinery, such as pumps and compressors.
- Strainers and filter elements.
- Pressure relieving devices, such as rupture disks and pressure relief valves.
- Locally mounted indicating pressure gages, where the test pressure will exceed their scale range.
- Equipment that cannot be drained.
- Any equipment where hydrostatic testing would be detrimental to its operation or internals.
- Instrument devices. Those instruments and instrument piping covered in Section 7.4 herein;
- Piping or equipment that has been pickled for cleanliness.

7.1.3 Isolation of Test Section

Block valves, blind flanges, spectacle blinds shall be used to isolate hydrotest sections of vessels, equipment and previously tested piping from the system to be tested. Ball or butterfly valve shall not be used as block valves for hydro-testing. In line ball valves shall be tested in the half open position. Thermo-wells shall be in place for pressure testing.

7.1.4 Test Packs

Piping system to be tested shall be divided into sections referred to as "Test Packs". Pressure test diagrams and line lists shall be provided by the Contractor and approved by the Company. The diagrams are generally color coded and mark-ups of piping and instrument diagrams with each separate system assigned a "Test Pack" number. A test pack shall include the following information as a minimum: a test pack number, line number and sizes, location of vents and drains, limits of the test as indicated on P&ID's, operating, design and test pressure and temperature, type of test fluid, tag number of items to be removed during testing, duration of test and requirements of flushing and drying.

Closure, welds, threaded joints, flanges and other connections being pressure tested shall be unpainted, exposed and visible. The surface of all parts to be inspected shall be cleaned with wire brush when necessary. Piping may be painted and insulated prior to pressure testing but all welds and joints shall be exposed for inspection.

7.1.5 Water Filling and Draining

All hydrostatic testing material shall be provided by the Contractor. Each piping system to be hydrostatically tested shall be filled with water with all high point vent connections or valves open. Each connection or valve shall be closed when all air at the location is vented and a continuous stream of water is flowing. After all connections or vent valves are closed, the system pressure shall be slowly raised in increments to test pressure and held at test pressure while system is inspected for leaks. Each weld and all joints shall be inspected individually. If leaks are found, the system shall be depressurized, the leaks corrected and the pressure test repeated. After the pressure test is completed, each piping system shall be depressurized by opening first the vents and then drains.

Each piping system shall be completely drained within 24 hours after testing and dried with air to remove all free water remaining after the pressure test. Drying shall be achieved by blowing with dry air to remove any trapped water (pneumatic flushing).

7.1.6 Test Duration

The test pressure shall be maintained for a sufficient time, but shall not be less than 30 minutes, to determine that there are no leaks.

7.1.7 Test Pressures

All piping systems shall be tested to the minimum pressure specified on the Line lists, Isometrics or in accordance with the requirements of ASME B31.3 Code. Vents and drains open to atmosphere are not required to be pressure tested, visual test only.

7.1.8 Skid Mounted Package Piping

Skid mounted piping systems which have been successfully shop tested by approved vendors undergone Factory Acceptance Test (FAT) witnessed by its Company designated representative, are excluded from the in-situ field test. The shop test becomes invalid if the packaged piping system has been subsequently repaired, modified or damaged.

7.1.9 Company Approval

Pressure test of piping system shall be performed only after the Company has approved the scope of each test. Written scope of tests shall include:

- Test Pack reference number
- Test location or test limits and the area to be enclosed (boundaries of test area)
- Type of operation, flushing, hydro/pneumatic test, drying, etc.
- Safety precaution requirements.
- Detail of chemicals to be added and method of disposal.

7.1.10 Examination Groups

Group	Definition where the following condition apply
Group 1	ASME Class 900 Rating and above for all services or fluids and all ASME Classes for lethal substances
Group 2	ASME Class 150, 300, or 600 for all services except: -Category 'M' Fluid Service(Lethal Service) refer to Group 1 -Category 'D' Fluid Service (refer to Group 3) For definition of categories, see ASME B31.3
Group 3 [Service Test]	ASME Class 150, when design pressure does not exceed 1035 kPag (150psig) and when the service of fluid content are: -Potable Water -Service Air -Instrument Air -Fresh Water -Nitrogen / Inert Gas

7.2 Pneumatic Testing or Special Alternate Tests

Pneumatic testing shall be performed only when approved by the Company. Written procedure for such testing shall be submitted to the Company and approved prior to testing take place. Testing area shall be cordoned off. During the test only authorized personnel are allowed within the testing area limits.

Pneumatic test shall be done with air unless specific system requires other inert gases such as nitrogen. The air for testing and cleaning shall be free of moisture and oil. Gas other than air shall be used only if approved in writing by the Company before testing. Internal surfaces of the piping to be tested shall be inspected and found clean before pneumatic tests are started.

Flanges shall be taped (under water repellent tape) around the circumference to seal the space between the flanges. Chloride free taps, shall be used for stainless steel. A small hole shall be punched through the tape at the top of the flanges. The hole in the tapes shall be swabbed during the test with an approved leak detection fluid to maintain a solution film subject to company

approval; an ultrasonic tester may be used for leak detection, in lieu of the solution film leak detection method. Details to be submitted with test procedure for review/approval prior to use.

All welds, threaded joints and other connection shall be swabbed with leak detection solution before and during the test period.

The system shall be pressurized to 200kPag (29psig) and a preliminary leak test shall be made. All joint shall be inspected and any leaks shall be corrected before proceeding with the test.

The test will be continued by slowly increasing the pressure in the system until the test pressure is reached. The test pressure shall be 1.1 times the design pressure, in accordance with ASME B31.3. The test pressure shall then be brought down to 90% of the test pressure and the system shall be inspected for leaks a second time. If leaks are found, the system shall be depressurized, the leaks corrected and the pressure test repeated. The pressure shall be maintained for a minimum of one (1) hour after all leaks are corrected. Upon completion of the test, the air or gas shall be released slowly.

Test all instrument air headers and piping leads up to the block valve immediately preceding the filter regulator with air at normal operating pressure. Test all instrument air tubing or pipe leads between instruments with air.

Because of the inherent danger and the lower test pressures used, COMPANY avoids pneumatic testing of piping systems, other than those specifically discussed in this specification. Any cases where the Contractor proposes pneumatic testing, procedures shall be submitted for COMPANY approval in advance. All pneumatic testing procedures shall be in accordance with the applicable Code.

Flare headers, from the blinding location downstream of process unit knockout drums to the base of the flare stack, shall be pneumatically tested per the applicable Code.

Piping with field installed linings which could be damaged by water may be pneumatically tested if hydro-testing is not practical prior to lining installation.

Piping that is chemically cleaned or pickled should be hydro-tested prior to cleaning. If this is not practical, pneumatic testing may be considered.

7.3 Hydrostatic Testing of Lines Connected to Vessels:

The alternate minimum hydrostatic test pressure permitted in the applicable Code is acceptable for lines connected to vessels provided full consideration is given to the maximum operating conditions of the entire line.

Where sections of lines cannot be isolated from a vessel due to the absence of flanged or threaded joints at the vessel, they may be tested at the test pressure permitted for the vessel per section 8.2.1 Herein.

Piping section open to atmosphere only:

- Atmospheric vents in hydrocarbon services, water fill and visual test only.
- No hydrocarbon vents, air intake and exhaust lines, visual test only

7.4 Instrument Piping

Displacement and ball float liquid level instruments, gauge glasses and gauge glass pipe columns together with the connected piping shall be tested per Section 7.1.7 herein. Instruments using internal floats shall have the floats removed during tests where the test pressure exceeds the collapsing pressure of the floats.

Instrument piping (other than that covered above herein) from the instrument piping block valve process connection up through the instrument, shall be pneumatically tested in accordance with the applicable Code using the following procedure.

Instrument air, utility air and glycol tracing systems shall be tested with plant air under normal operating conditions.

For systems that have previously seen hydrocarbon service, the test medium shall be nitrogen. A separate safety relief valve is required on the nitrogen supply line or a relieving device built into the nitrogen regulator may be used (in lieu of separate safety relief valve) when tests at several different pressures are to be made. Either relief device shall be set to relieve at not more than 0.34bar (5psig) or 5 percent (whichever is greater) above the test pressure to be used on the instrument piping.

Determine pneumatic test pressure per the applicable Code for each instrument piping system.

Testing other instruments piped up to process lines or equipment, including analyzers, pressure transmitters, remote mounted pressure gauges, etc.

- Check that system is free of water. Check that all joints are tight.
- Check that process line shut-off valves are tightly closed.
- Check that block valves at instrument are open.
- Hook up nitrogen to one drain valve and close other drain valves, if provided.
- With system at full test pressure, apply a leak detector at all joints, connections, etc. Detector to be to be 'Snoop Liquid Leak Detector' or equal. Repair leaks as required.
- After completion of test, leave instrument piping isolated from the process line.

7.5 Other Field Hydrostatic Equipment Testing

Further field hydrostatic testing of shop tested equipment is not required, unless repairs or alterations have been made in the field.

Field fabricated vessels shall be field tested in accordance with the applicable code.

7.6 Retests

Retests at the same hydrostatic pressure originally used shall be made after field modifications and/or repairs (by welding).

7.7 Testing of Reinforcing Pads

Reinforcing pad of welded branch connections shall be pneumatically leak tested with air at 173kPag or (25psig) through a tapped vent hole (weep hole), and examined for leaks using a soap solution at a reduced pressure of 21 to 35 kPag or 3 to 5psig. The tapped vent hole shall be packed with heavy grease after the completion of test.

7.8 Testing of Seal and Lube Oil system and Hydraulic Fluid Systems

Seal oil and lube oil piping system and hydraulic fluid piping systems fabricated from ferrous materials shall be chemically cleaned to remove all mill scale, dirt and other foreign matter from the interior of the pipe.

The cleaned and passivated lube oil and seal oil piping systems and hydraulic fluid systems shall be hydrostatically tested using lube oil or hydraulic fluid, as appropriate as the testing medium and generally following the above procedure for hydro-testing after the pressure test is complete, the pressure shall be released but the lube oil or hydraulic fluid as appropriate shall be left in the piping to prevent contamination.

Seal oil and lube oil piping systems and hydraulic fluid piping systems fabricated from stainless steel materials shall be blown clean with dry air prior to assembly. These systems shall be subject to either a pneumatic pressure test or a pressure test using lube oil or hydraulic fluid as appropriate as the test medium.

8. SYSTEM TESTING

8.1 General

To facilitate the field hydrostatic testing of piping, connected equipment (except the equipment excluded for Category D fluid) may be included in a system type test provided the maximum hydrostatic test pressure permitted under next Section herein for such equipment is not exceeded.

8.2 Limitations - Connected Equipment

The maximum hydrostatic test pressure on any piece of standard commercial equipment permitted in a system test of piping shall not exceed the lesser of the following:

- Manufacturer's shop test pressure.
- Manufacturer's recommended test pressure.

8.2.1 Vessels

The maximum hydrostatic test pressure at the bottom of vertical and horizontal vessels in new uncorroded condition and erected position shall not exceed the shop test pressure.

8.3 Limitations - Piping Systems

8.3.1 Minimum Test Pressure

The minimum test pressure of any single line shall not be less than specified in Section 7.1.7.

8.3.2 Flanges and Flanged Fittings

The hydrostatic shell test pressure in accordance with ASME B16.5.

8.3.3 Valves

- The manufacturer's shop hydrostatic shell test pressure.
- The manufacturer's shop seat test pressure in cases where a valve in the closed position would be subjected to the line test pressure.

8.3.4 Special Piping Components

Special piping components, such as expansion joints, strainers, etc., shall not be subjected to a test pressure in excess of the manufacturer's maximum allowable working pressure or recommended test pressure.

9. TEST MEDIA

9.1 Fluids

When required by the Company, the water shall be treated with biocide to prevent bacterial growth. Corrosion inhibitor shall also be added when specified by the Company. A Company approved procedure for the safe use and disposal of the test water and chemicals shall be in place prior to testing take place.

Water shall be used for all field hydrostatic tests, unless other media are allowed by this specification or specified in the engineering design. In the event damage may occur to pipes or equipment due to freezing conditions or the chance of freezing conditions, a water/glycol mix or a water/methanol mix may be used in lieu of water as a test media, with specific approval by COMPANY.

Procedures for supply of test water and testing of water purity shall be approved in writing by COMPANY. The quality of a test fluid shall not be detrimental to the equipment, materials or process involved. Condensate or treated water may be required for piping such as boiler feed-water systems.

Water for flushing, testing of equipment and piping containing austenitic materials (except valve trim) shall be the lowest chloride content available (not to exceed 30ppm chlorides).

9.2 Test Temperature

The field test pressure shall not be applied until equipment and its contents reach approximately the same temperature.

- The following test metal temperature shall be observed for testing carbon steel and ferritic alloy pressure vessels, unless the steel has been impact tested at a lower temperature.
- Shell thickness less than 38mm thick: 15°C minimum
- Shell thickness of 38mm through 76mm: 40°C minimum
- Shell thickness over 76mm: Handled on an individual basis

Test temperatures for piping (not to include vessels) may be lower than those temperatures listed above provided the following are considered:

- Care should be taken to prevent freezing of the lines.
- Testing is above minimum allowable temperatures for the material as specified in the applicable Code.

In no case shall test water temperatures for austenitic stainless steel equipment and for stainless steel internals (valve trim excluded) exceed 50°C.

Where testing must be done at metal temperatures greater than 93°C, and the test pressures are calculated on the basis of an allowable stress, the test pressure must be adjusted accordingly.

10. TESTING DATA, RECORDS AND COORDINATION

10.1 Testing Data

Testing schedules and diagrams, for all lines to be field tested, shall be prepared to facilitate the grouping of lines and connected equipment (where permitted) in a systems test. Such information shall be developed and prepared prior to commencing with any testing. The testing schedules and diagrams shall be approved in advance by COMPANY.

The schedules or diagrams shall contain the following information:

Individual Lines:

1. Line identification
2. Maximum test pressure
3. Minimum test pressure
4. Test medium to be used

Connected Equipment:

1. Equipment identification
2. Maximum test pressure permitted and point of application

System Testing:

The information required for system testing shall be presented by means of marked-up mechanical flow diagrams.

1. Identification of lines in each group.
2. Identification of connected equipment in each group.
3. Test medium to be used in each group.
4. Test pressure to be used in each group and point of application.
5. Location of test blinds in each group.
6. Tie-in spool pieces shall be identified and tested separately from new piping.

Copies of data under this Sections 10.1 shall be furnished as part of the required job data. Copies shall be furnished for use by the COMPANY.

10.2 Records of Test

Upon satisfactory completion of each field test, a record shall be made containing the following information:

1. Date of test
2. Identification of item(s) tested
3. Test medium
4. Test pressure
5. Ambient temperature
6. Approval signatures by both Contractor and COMPANY Site Incharge

7. Duration of Test - the period when the system under test is filled full until draining commences shall be no longer than 24 hours.

Test records required by Code shall be given to an authorized Governmental and/or Code Inspector who will in turn certify compliance to Code. This certification shall also include a list of marked flow diagrams to indicate where blinds were used and confirm that such blinds were removed or in the case where operational blinds were used for testing that the blind part of such blinds was replaced with a spacer.

10.3 Coordination

COMPANY shall be notified in advance of any field testing. All field testing shall be witnessed by COMPANY Site In-charge. Where government or other codes require specific and/or referee witnessing of field testing, the Contractor will arrange for the presence of properly authorized Inspectors.

11. PRECAUTIONS, PREPARATIONS AND PROCEDURES

11.1 Precautions

The effect of hydrostatic head shall be considered when determining correct test gauge reading and the safe and/or effective test pressure of any element within a test system.

Caution shall be exercised in hydrostatic system testing to assure that the simultaneous testing of large equipment and piping does not overload supporting structures and foundations. Any system under hydrostatic test shall be carefully observed and proper cautions taken and procedures established to prevent over-pressuring of lines and equipment.

Hazards to personnel and property shall be minimized during pneumatic testing.

11.2 Preparations

Before filling a system for testing, all piping and connected equipment shall be thoroughly cleaned and flushed with clean water. When tests other than hydrostatic are required, lines may be blown with steam or air. Lines and equipment shall be thoroughly purged of air before hydrostatic test pressure is applied. Before pressure testing, all lines and/or systems shall be inspected to ensure connected parts not to be included in the test are isolated. At least two adequately ranged test gauges, calibrated prior to use and suitably located, shall be connected to system being tested.

For hydrostatic testing, the test pump discharge line shall be equipped with a pressure relief valve set to relieve at not more than 0.34bar (5psig) or 5 percent (whichever is greater) above the permissible test pressure for the weakest component in the system being tested.

For pneumatic testing, the supply line shall be equipped with a pressure relief valve set to relieve at not more than 0.34bar (5psig) or 5 percent (whichever is greater) above the required test pressures.

All orifice plates shall be removed for testing. Expansion joints that cannot be secured against deformation during hydrostatic test shall be removed from piping system being tested. Control valves shall be set and maintained in the wide open position. Lines that are spring or counter-weight supported shall be blocked up during test in order to sustain the hydrostatic load.

Piping designed for vapor or gas shall be provided with additional temporary supports, if necessary, to support the weight of the test liquid.

11.3 Procedures

Operational blinds may be used for field testing. Any other test blinds or blanks required for field testing during initial construction shall be furnished by the Contractor.

Field testing of piping shall be performed before insulation is applied. If insulation is applied before field testing, all shop welds (excluding welds which have been shop or mill hydrostatically tested), field welds and field joints shall be left exposed until field testing is complete. Lines containing check valves should have the source of pressure located upstream of the check valve. If this is not possible, the check valves should be either removed or blanked off. Piping, which must be removed to permit installation of test blinds or blanks, shall be tested separately.

Underground lines requiring testing shall be tested before being backfilled, except where specified or approved by COMPANY, lines may be partially backfilled before testing provided all shop and mill welds not previously tested and all field joints are left exposed.

Where piping being tested extends beyond the process unit limit without flanges, it shall be tested to the first block valve or set of flanges outside the unit limits. Care shall be taken that lines tested beyond unit limits are able to withstand test pressure to be used.

Upon completion of test, the test pressuring manifold shall be immediately disconnected from the system being tested.

When hydrostatic testing is done during freezing weather, the system being tested shall be immediately and completely drained. Any non-drainable portions, where freezing may damage equipment or operation, shall be protected from freezing. After satisfactory completion of hydrostatic testing, all temporary blinds shall be removed and the system cleaned & drained. Vents shall be open when draining systems. All valves, orifice plates, expansion joints, short pieces of piping and other excluded equipment shall be installed. Valves that were closed solely for hydrostatic testing shall be opened. After system has been drained, temporary pipe supports shall be removed. Upon completion of hydro-testing the piping systems shall be flushed with inhibited potable water, drained down and vacuum dried to ensure no residual water remains.

12. QUALITY ASSURANCE

The Contractor shall maintain quality assurance systems which comply with the requirements of ISO 9001 - Quality Management.

APPENDIX-A5



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
PRODUCTION WELDING
DOC. NO: 0504196-MEC-SP-005

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1.0 INTRODUCTION

1.1 GENERAL

This Specification covers the basic requirements for welding, heat treating, and non-destructive examination of certain pressure-containing components. This includes piping, pressure vessels, fired heater coils, heat exchangers, pumps and compressors etc. requirements also apply to structural attachment welds in such equipment.

1.2 DEFINITION

Following definitions apply throughout this document:

Company / Owner	Oil & Gas Development Company Limited (OGDCL)
Contractor	“Contractor” means the person or persons, firm or Proprietor whose proposal has been accepted by the Company for verification of FEED package, engineering design, procurement, inspection, supply of material and equipment, construction/ commissioning, performance testing, one year of defect liability period and training of Company’s personnel for the project and includes the Contractor's representative(s), successors and permitted assignees.
Vendor / Supplier	The organization, firm or agency with whom order for the supply of equipment and or material has been placed.

1.3 ERRORS OR OMISSIONS

Review and comment by the COMPANY of any CONTRACTOR / SUPPLIER’s drawing procedures or documents shall only indicate acceptance of general requirements and shall not relieve the CONTRACTOR / SUPPLIER of its obligations to comply with the requirements of this specification and other related parts of the contract documents. Any errors or omissions noted by the CONTRACTOR / SUPPLIER in this Specification shall be immediately brought to the attention of the COMPANY.

1.4 DEVIATION

All deviations to this specification, other specifications or attachments shall be brought to the knowledge of the COMPANY in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the COMPANY prior to

execution of the work. Such deviations shall be shown in the documentation prepared by the CONTRACTOR / SUPPLIER.

1.5 CONFLICTING REQUIREMENTS

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, Codes & Standards referenced in this Specification or any other documents, the CONTRACTOR / SUPPLIER shall refer to the COMPANY whose decision shall prevail.

2.0 REFERENCE

The following Guides and industry publications are referenced herein and shall be considered a part of this Specification. Refer to the latest editions unless otherwise specified.

ASME	American Society of Mechanical Engineers
ASME B31.3	Process Piping
ASME SEC II-C	Material Specifications - Welding Rods, Electrodes and Filler Metals
ASME SEC V	BPVC SECTION V Nondestructive Examination
ASME SEC V B SE-94	STANDARD GUIDE FOR RADIOGRAPHIC EXAMINATION
ASME SEC VIII	Rules for Construction of Pressure Vessels
ASME SEC IX	Qualification Standard for Welding and Brazing Procedures, Welding and Brazing Operators
AWS	American Welding Society

2.1 APPLICABLE PROJECT SPECIFICATIONS

- Piping Specification
- Specification for Export Packing & Crafting
- Specification for Skid Mounted Packages
- Specification for Painting and Surface Preparation
- Specification for Production Welding
- Specification for Unfired Pressure Vessel
- Specification for Insulation
- Specification for General & packaged equipment instrumentation

3.0 WELDING PROCEDURE AND WELDER QUALIFICATIONS

3.1 WELDING PROCEDURES

Welding procedures shall be in writing and shall be qualified in accordance with ASME SEC IX and this Specification, using the latest revision in effect on the date of the purchase order for the equipment being fabricated. All welding procedures shall include a weld procedure specification (WPS) and a procedure qualification record (PQR).

Complete welding procedures for all materials to be welded shall be submitted to the COMPANY for review and approval prior to use. These procedures shall include the following: Welding Procedure Specifications, Procedure Qualification Test Records, ranges of variables qualified, a weld map or description identifying which welding procedure will be used for each weld and the method and extent of inspection. The CONTRACTOR / SUPPLIER shall furnish complete information for each applicable item, as required. For piping a typical drawing representing all applicable weld procedures to be used on the work shall be submitted to the COMPANY for approval prior to work commencing.

Complete welding procedures shall be submitted for approval sufficiently in advance of the actual welding, so as to allow for adequate review and approval. A typical weld map (or specific weld map) where each procedure will be used shall be included with this submittal. No welding shall be performed until all such welding procedures are approved by the COMPANY.

The information contained in each welding procedure specification and in the procedure qualification test records shall include, but not be limited to, the information contained on forms QW 482 and QW 483 shown in ASME SEC IX.

All welding procedures shall be identified by number and referenced on all applicable fabrication drawings.

3.2 QUALIFICATION OF WELDING PROCEDURES

P-number shall be considered an essential variable for all welding processes. Materials that do not have P-numbers (not listed in QW 422 of ASME SEC IX) shall be qualified individually.

Welding position shall be considered an essential variable for groove welds in all welding processes.

All welding consumables not listed in ASME SEC II-C shall be individually qualified.

For submerged arc welding, brand name and grade of flux shall be considered an essential variable, together with changes in speed or heat input beyond the range qualified. The procedure qualification test record shall indicate the name of the manufacturer, plus the trade name of the wire and flux used to qualify the procedure.

Postweld heat treatment (time and temperature) shall be considered an essential variable for P-3, P-4, P-5, and P-6 materials. A decrease in time of more than 15 percent and/or in temperature of 10 percent or more, from the range qualified, will require a separate welding procedure qualification.

Impact testing of welds and heat-affected zones (HAZ) for ferritic materials at minimum design temperature is required for welding procedure qualification under the following conditions:

- a) When the base material requires impact testing;
- b) When the base material does not require impact testing, but the material thickness exceeds 12.7 mm (1/2 in) and the minimum design temperature is 0°C (32°F) or lower;
- c) When the base metal does not require impact testing, but the submerged arc welding process is used with weld pass thickness greater than 9.5 mm (3/8 in).

When impact testing is required, the Charpy V-notch impact values for parent material, weld metal and heat-affected zones shall be not less than those specified in ASME B31.3, Table 323.2.2. The impact test shall be performed on the same type (ASTM or other similar specification) and grade of material as will be used in fabrication.

Procedure qualifications for weld overlay deposits shall include a complete chemical analysis of the overlay, procedure qualification test record, and unless specifically waived by the COMPANY, a sample of the overlay. Specimens taken for chemical analysis shall be representative of material 2.5 mm (0.1 in) below the surface. The weld metal chemical composition shall be within the nominal range specified for the alloy. Monel overlays shall have a maximum iron content of 4.5 percent. The procedure qualification tests shall include the following:

- a) Dye penetrant examination of the completed weld.
- b) Side bend tests per QW 453 for weld metal soundness.
- c) Chemical composition analysis per QW 462.

Excessive fissuring shall be caused for rejection. Fissures shall not exceed four per specimen, nor shall they exceed 1.6 mm (1/16 in) in length. Cracks in corners shall not be considered part of the examination.

The welding procedure qualification tests shall include hardness tests of base, HAZ, and weld for the following materials:

- a) Quenched and tempered carbon steel;
- b) High-strength, low-alloy (HSLA) steel;
- c) Carbon-molybdenum (C-Mo), manganese-molybdenum (Mn-Mo), and chromium-molybdenum (Cr-Mo) steels;
- d) Other air-hardenable materials.

Procedure qualification tests for welding carbon steel shall also include a hardness survey, if any of the following conditions exist:

- a) Submerged arc welding is performed with F8XX or higher flux designation;
- b) Shielded metal arc welding is performed with covered electrodes of E80XX or higher classification;
- c) Filler Metal contains at least 1.6 percent manganese, or manganese and silicon exceed 1.4 and 0.8 percent, respectively;
- d) The job specifications or data sheets require a maximum specified hardness in the weld and/or heat-affected zone.
- e) Process conditions (wet hydrogen sulfide, amine, caustic) require production hardness testing.

The hardness testing for welding procedure qualification shall be performed on the base metal, weld, and heat-affected zone, with an instrument having an indenter not larger than 1.6 mm (1/16 in) in diameter. The hardness shall be reported as Brinell (HB) or Vickers (HV) equivalent numbers. Hardness surveys shall be performed along two lines parallel to the outer and inner surfaces of the weld and located approximately 2 mm (0.08 in) below them. The type of hardness test instrument

shall report and the test results shall meet the hardness requirement in accordance with ASME B31.3.

Welding procedure tests shall demonstrate that all details are capable of producing satisfactory full-penetration butt welds, unless the weld joints are specifically designated as fillet welds.

For gas tungsten arc and gas metal arc welding, the qualification record shall include the composition and flow rate of the shielding and inert gas backing, if used.

For the gas metal arc process, the electrode diameter and extension, amperage, voltage, wire feed rate, and travel speed shall be specified in the welding procedure.

Base material used in qualification tests shall have the nominal chemistry and mechanical properties of the material to be welded. For carbon steel, the carbon content of base material shall be at the higher end of the specification range.

3.3 QUALIFICATION OF WELDERS & WELDING OPERATORS

Welders and welding operators shall be qualified in accordance with ASME SEC IX and local requirements, as a minimum. Qualification shall be completed prior to start of fabrication. Performance qualification records shall be made available to the COMPANY upon request. At the COMPANY option, witnessing of performance qualification, welding, and testing may be required.

Qualification of welders and welding operators solely by means of radiography of a weld sample is subject to the COMPANY approval.

Qualification of welders using the GMAW process shall be by mechanical testing only.

4.0 WELDING PROCESSES

Welds shall be made by the shielded metal arc, gas tungsten arc, gas metal arc, or submerged arc welding process. All other welding processing, including electro gas, electro-slag, oxyacetylene and the flux cored process, require prior to the COMPANY approval.

The flux cored arc welding (FCAW) process may be used, subject to the COMPANY review and approval (proposal to use FCAW must be submitted prior to order placement), provided the following conditions exist:

- Gas shielding is used.

- Material to be welded is carbon steel or for application of weld overlay on carbon steel or low alloy steel.
- FCAW process is not "short arc"
- FCAW process is not used for the root pass in single-sided welding.
- Production consumables are restricted to the manufacturer and grade qualified.
- Only EXXT-1 or EXXT-5 (flat or horizontal position only) welding wires are used.
- Service is not hot hydrogen [over 260°C (500°F)], wet hydrogen sulfide, or hydrogen fluoride
- At least five percent of the individual welds are 100 percent radiographed or ultrasonically examined.
- Ten percent of the nozzle to shell or head welds (including at least one of each size) shall be 100 percent radiographed or ultrasonically examined.
- Low hydrogen electrodes are used.

For all other applications not meeting the above conditions, FCAW process may be considered on a case-by-case basis. The review will include the evaluation of the specific application, verification of the fabricator's experience, additional qualification and/or NDE requirements, and the COMPANY witnessing of welding procedure and/or welder qualification

The gas metal arc process (GMAW) in the "short circulating transfer" (short) mode may be used for the following purposes:

- Root passes welding in a combination process.
- Fit-up welding that will subsequently be completely removed by back gouging, chipping, or grinding
- Weld metal overlays made in the flat position
- Non-pressure retaining fillet welds made in the flat, horizontal, or vertical up positions.

The short arc process shall not be used under the following conditions:

- Where the joint geometry or large mass can affect the integrity of the weld; for example, on nozzles, couplings, slip-on flanges, socket-welded flanges, O-type branch fittings, or extended surface (FIN) attachments.

With ferritic or martensitic filler metal, for design service below 0°C (32°F).

During GMAW short arc welding of the root pass, the root gap (including tolerance) shall not be less than 2.4 mm (0.1 in) wide. The root face thickness (including tolerance) shall not exceed 0.8 mm (3/32 in). All tack welds shall both ends ground to feather edge.

Except for piping, double-welded butt joints shall be used wherever possible in Pressure-containing equipment. Where access or wall thickness precludes of double-welded butt joints, single-welded joints may be made. This requires a root pass deposited by the GTAW process or (subject to the COMPANY approval) by the GMAW process.

A gas tungsten arc root pass is required for the following circumstances:

- Single-welded, full-penetration butt joints in C-Mo, Mn-Mo, and Cr-Mo steels; in all non-ferrous alloys; and in carbon steel for hydrogen fluoride service.
- All heater tubes
- All carbon steel single-welded, full-penetration butt joints over 38 mm (1.5 in) thick.

In an inert gas welding process, inert gas backing (argon or helium) is for carbon steels, carbon-molybdenum steels, or low-alloy chromium molybdenum steels with a chromium content not exceeding 1½ percent by weight. Inert gas backing shall be used for all other alloy materials, including aluminum and copper alloys. The use of nitrogen, however, for gas shielding of stainless steel shall not be allowed.

The following restrictions and limitations apply to all welding processes.

- All welding processes shall be protected from wind, rain, and other harmful weather conditions that can affect weld quality. CONTRACTOR / shall provide habitat arrangements that afford full weather protection as approved by the COMPANY.
- Welding techniques shall be selected to ensure that specified tolerances for straightness and out-of-roundness are not exceeded. If such tolerances are not stated in the drawings, standards, or specifications, the applicable section of the relevant code shall govern.
- Welded joints shall be made by completing each layer before succeeding layers are deposited. Block welding is prohibited.
- Vertical welding shall be performed vertically up; downward vertical position welding shall not be permitted unless specifically approved in writing by the COMPANY.

The following limitations shall apply when welding aluminum:

- The gas tungsten arc process shall not use thoriated tungsten electrodes. Electrode configuration shall be shown in the welding procedure and shall be considered an essential welding variable. In case any deviation, COMPANY approval will required.

- Except for piping, the gas metal arc process shall employ run on and run off tabs in all groove welding.
- For all processes, the welding procedure shall contain a detailed cleaning treatment indicating joint preparation prior to welding. All full-penetration joints shall be back-purged with argon or helium.

5.0 MATERIALS

5.1 FILLER MATERIAL & FLUX

Filler metal for welding similar materials shall be of the same nominal analysis as the base material, except as follows:

- AWS Type 347 filler metal shall be used for welding Type 321 stainless steel material.
- AWS Type 308 filler metal shall be used for welding Type 304 stainless steel material. (Type 308L shall be used for Type 304L.)
- The following filler metals shall be used for welding 11 to 13 percent chromium steels: Inco-Weld A; Inconel 82 or 182; AWS E309, E410, or E410Cb. However, for 11 to 13 percent steels in cyclic service, or for design temperatures over 350°C (660°F), only Inco-Weld A, Inconel 82, or Inconel 182 are acceptable.
- For chromium-molybdenum steel, filler materials such as Inconel 82 or 182 or Inco-Weld A may be used, if approved by COMPANY.
- Filler metals for welds joining dissimilar materials shall be in accordance Table 1. Filler metals for combinations of materials other than those in Table 1 shall be submitted to COMPANY for approval.

5.2 BACKING RINGS & CONSUMABLE INSERTS

Permanently installed backing rings or strips shall not be used. Consumable inserts shall be used only with prior COMPANY approval.

5.3 JOINT PREPARATION, SPACING, AND ALIGNMENT

5.3.1 EDGE PREPARATION

Welding bevels shall be suitable for the welding process to be used. For pressure-containing welds, the contour shall permit complete fusion throughout the joint. Bevels shall conform reasonably to those used in the procedure qualification.

All weld bevels and weld surfaces shall be free from cracks, porosity, slag inclusions, and other defects indicative of inferior workmanship.

Weld bevels shall be made by machining, grinding, or thermal cutting; the surfaces shall be smooth, free of burning dross or fluting and true. Materials that require preheat for welding (refer to Section 10.1) shall be preheated in the same manner for thermal cutting or gouging.

Special weld bevel preparation is required for quenched and tempered carbon steels, HSLA steels, and steels containing more than 1/2 percent chromium. The steels shall be machined or ground back to clean and sound metal if they are flame or arc cut. At least 1.6 mm (1/16 in) of metal shall be removed.

Socket-welded joints shall have a gap between the bottom of the socket and the end of the pipe to be welded. The gap opening shall be at least 1.6 mm (1/16 in). The pipe for socket welding shall be square cut.

5.3.2 CLEANING

All surfaces to be welded shall be clean and free from paint, oil, dirt, scale, oxides, and other contaminants detrimental to welding. Cleaning shall be performed in a manner that will not lead to additional contamination of the weld or adjoining base metal.

Only stainless steel brushes and tools shall be used on stainless steel and nickel-alloyed materials.

Grinding disks containing sulfur (iron sulfide) shall not be used on steels with 5 through 9 percent nickel, stainless and alloy steels, or on nonferrous materials.

Cleanliness shall be maintained after completion of welding. All stubs, rods, flux, slag, and foreign material shall be removed from the vicinity of the equipment or piping.

5.3.3 BUTT JOINTS

Full penetration welds are required for single-sided welded joints.

Double-welded joints shall be prepared for back welding by grinding, arcair gouging and grinding or chipping, so as to allow complete penetration and fusion. The depth of the back cut shall be sufficient to remove all the initial 1st pass welds but not deep enough to cause distortion in the welded joint by excess 2nd side welding.

5.3.4 TACK WELDS

All tacks in the weld groove shall be performed by qualified welders (in conformance with ASME SEC IX), according to an approved welding procedure. Tack welding procedures, including for bridge and bullet tacks shall be qualified prior to fabrication operations.

Non-groove tack welds to be incorporated into the main weld seams shall have the ends ground and feathered.

Tack welds made by non-ASME SEC IX welders shall be completely ground out. The ground areas shall be examined by the magnetic particle or dye penetrant method prior to completing the permanent weld.

5.3.5 WELD CONTOUR AND FINISH

Weld beads shall be contoured to permit complete fusion at the sides of the and to eliminate inter run and side wall slag inclusions. Flux and slag shall be removed completely from weld beads and from the surface of completed welds and adjoining base material. The flux removal shall be performed in a manner that will not cause the weld or adjoining base material to become contaminated overheated.

Weld reinforcement and finish shall be as required by the applicable codes and standards. Undercutting of base metal is prohibited, except for piping fabricated according to ASME B31.3, undercutting shall be removed by smooth profile toe grinding, where allowed.

After removal of temporary welded attachments on all materials, except carbon steel (P-1) and austenitic stainless steel (P-8), the weld area shall be dressed examined by magnetic particle or dye penetrant for the detection of cracks. Any defects found shall be removed and repaired.

Peening of partial or completed welds shall not be permitted, unless prior approval is given by COMPANY and the CONTRACTOR / SUPPLIER can demonstrate that the final weld joint integrity has not been affected.

All arc strikes, starts, and stops shall be confined to the welding groove. Arc strikes outside the welding groove shall be removed by grinding and examined by magnetic particle or liquid dye penetrant.

5.3.6 ALLOY LINING

CONTRACTOR/VENDOR approval is required for any proposed alloy system.

For both integrally clad plate and weld overlay, the surface of base plate welds that would be exposed to the corrosive environment shall be protected by depositing not less than two layers of corrosion-resistant weld metal.

In austenitic stainless steel overlays, where the base metal requires PWHT or design temperature exceeds 450°C (840°F), the first weld layer shall be made with Type 309L. Subsequent layers of deposit shall be made with low-carbon, Cr-8 Ni stainless steel, or stabilized grades of austenitic stainless, depending upon service conditions.

For Monel overlays on carbon or low-alloy steel, the first layer shall be made a high-nickel consumable (nickel or Inconel). The second and any successive shall be made with a filler metal that nominally matches the Monel chemistry. First layer of high-nickel deposit shall be applied over bright, clean, and oxide-free.

When integrally clad stainless plates are being joined, the following shall apply:

- The clad layer shall be stripped for a minimum distance of 8 mm (0.31 in) from the bevel. In addition, the base material shall be etched with nitric acid or copper sulfate to ensure prevention of austenitic weld dilution.
- When the cladding is removed, the base material thickness shall not be reduced below the design thickness by more than 1 mm (0.04 in).
- The procedure for back-cladding of internal attachments and requires approval by COMPANY. This procedure shall include base metal examination, welding sequence, and final inspection.

All internal exposed alloy welds joining clad components, and all alloy weld overlays inside vessels and heat exchangers shall be fully examined by the liquid dye penetrant method.

A certified report of the chemical analysis of production as-deposited alloy weld overlays, or alloy welds covering base metal welds in clad plates, shall be furnished to COMPANY. The weld metal chemistry shall be within the nominal range specified for the alloy. At least three drillings from each vessel section (vessel can), each heat exchanger, and each head shall be made to obtain sample material for analysis. One sample shall be taken at the beginning of the overlay and two samples at

locations to be designated by the inspector. The samples shall be taken 2.5 mm (0.1 in) below the surface of the material.

Welding overlays shall be qualified in accordance with the WPS and PQR requirements specified herein. The Procedure Qualification Record shall also include corrosion testing of the weld overlays, specifically the ASTM G48 test and the ASTM A262 test. The G48 test shall yield a corrosion rate of 5 mpy or less. The A262 test shall show no evidence of cracking or pitting at 100x magnification.

5.4 THERMAL TREATMENT

5.4.1 PREHEAT & INTERPASS TEMPERATURE

The minimum preheat temperatures for thermal cutting, arc-air gouging, and welding (including butt, fillet, socket, seal, and tack welds) shall be in with the requirements of the applicable code.

Exceptions are as follows:

- No welding shall be performed when metal temperature is 0°C (32°F) or lower.
- Carbon steel shall be preheated to 10°C (50°F) , minimum, unless electrodes are to be used.
- Carbon steel shall be preheated to 93°C (200°F), minimum, when any of the following conditions apply:
 - Base metal thickness exceeds 25.4 mm (1 in)
 - Carbon content exceeds 0.30 percent
 - Carbon equivalent exceeds 0.43 percent, based on:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

- The material is highly restrained; for example, nozzles or major attachments.
- All ferritic alloy materials shall be preheated in accordance with Table 2.
- The maximum interpass temperature for austenitic stainless steels shall be 180°C (350°F).

The maximum preheat and inter-pass temperature for carbon steel and low-alloy steel shall be 300°C (572°F), unless otherwise approved by COMPANY.

During the welding of a casting, an area extending 300 mm (12 in) on either side of the weld shall be maintained at the approved preheat and inter-pass temperature.

Preheat and inter-pass temperature shall be determined by temperature-indicating crayons, contact pyrometers, thermocouples, or other equally suitable means. Temperature-indicating crayons used on austenitic stainless steels and nickel-base alloys shall cause no corrosive or other harmful effects. They shall not contain more than one percent by weight of total halogens or sulfur, or 200 ppm by weight of inorganic halogens. It is the fabricator's responsibility to determine suitable brands and melting temperatures that may be used. This information shall be made available to COMPANY upon request.

When the specified preheat temperature is 150°C (300°F) or higher, the metal shall be maintained at preheat temperature until the welds are completed. The preheat temperature shall be maintained until the start of post weld heat treatment or unless an intermediate tempering treatment is performed, for welds in thickness over 50 mm (2 in) or under a high degree of restraint (at nozzles, branch connections, and the like). COMPANY shall be consulted if uncertainties exist regarding the degree of restraint. An intermediate tempering heat treatment shall consist of heating to 600°C (1100°F), minimum, holding for a minimum of 15 minutes, and cooling slowly to the ambient temperature.

As an alternative for butt welds only, a hydrogen out-gassing treatment can be substituted for the intermediate tempering treatment. The hydrogen out-gassing procedure shall consist of either raising the preheat temperature to 260°C - 300°C (500°F - 570°F) and holding for four hours, or raising the preheat temperature to 325°C - 400°C (620°F - 750°F) and holding for two hours. All other pressure welds, such as nozzle and manhole attachment welds, shall be given the full 600°C (1100°F) tempering treatment. The foregoing out-gassing procedure does not apply to 5 through 9 percent nickel steels.

5.4.2 POSTWELD HEAT TREATMENT (PWHT)

PWHT shall conform to the applicable construction code, except as follows:

- Minimum PWHT of ferric materials shall conform to Table 3.
- All ferritic piping materials, except carbon steel piping with wall thickness 19 mm (3/4 in) or less (nominal thickness), shall be postweld heat treated.

- The PWHT for welds joining austenitic stainless steels to dissimilar materials shall be as specified in the qualified welding procedure and approved by COMPANY prior to the start of fabrication.
- Under special circumstances (non-critical service), PWHT of field welds in low-alloy steels (C-Mo, Mn-Mo, and Cr-Mo) made with Inconel filler metal may be omitted, subject to COMPANY approval.
- For P-6 materials, the PWHT temperature used shall be the lowest possible to avoid overheating and hardening on cooling.
- Holding time at PWHT temperatures shall be one hour per 25.4 mm (1 in) of thickness, with a one-hour minimum. For chromium molybdenum steels (1/2 to 9 percent chromium) and 12 percent chromium stainless steels, the minimum holding time shall be two hours.
- For P-3, P-4, P-5, and P-6 materials, the production PWHT (time and temperature) shall be essentially the same as in the welding procedure qualifications.
- A sufficient number of thermocouples or other acceptable measuring devices shall be attached, so as to accurately indicate metal temperature in all critical areas during PWHT.
- Direct flame impingement by torch or furnace burner during PWHT is not permitted.
- No exothermic heat treatment shall be allowed without prior written approval from COMPANY.

The maximum Brinell hardness of welds and heat-affected zones in all steels after heat treatment shall be in accordance with ASME B31.3. If welds are furnace heat treated, a sufficient number (10 percent) shall be tested to verify that the hardness criterion has been met. If local heat treatment has been applied, each weld shall be tested.

6.0 INSPECTION AND EXAMINATION

6.1 GENERAL

Examinations of welds shall conform to procedures and acceptance standards required by the ASME Code. The exception is piping, which shall be in accordance with specification for fabrication/installation of piping and the paragraphs of this section.

Table 4: Weld Examination Procedures and Acceptance Standards

Method	Standard, ASME Code
	Section VIII
Radiography:	
- Complete	Par. UW 51
- Random	Par. UW 52
Magnetic particle	Appendix 6
Liquid penetrant	Appendix 8
Ultrasonic	Appendix 12

Notes:

- Examination of piping welds fabricated in accordance with ASME B31.3 shall be in accordance with Specification for Fabrication/Installation of Piping. Minimum 10% RT shall be carried out for CS Joints and 100% for SS Joints.
- Detailed weld inspection procedures and acceptance criteria shall be reviewed and approved by COMPANY.

All inspection and non-destructive examination (NDE) procedures shall be in writing and submitted to COMPANY for approval. All inspections and NDE shall be performed in accordance with the approved procedures. The NDE operators shall be at least ASNT Level Ⅱ certified for the examination they are performing.

Welds that are to be examined by non-destructive methods shall be finished as required by the applicable code.

6.2 RADIOGRAPHIC EXAMINATION

The following are additional requirements for radiographic examination:

- ASME SEC V-B-2-SE-94 Type 1 fine-grain film (Kodak AA or equivalent) shall be used.

- Only lead screens shall be used.
- Use of penetrameters other than those specified in ASME SEC V-B-2-SE-94, Article 2 and 22 (ASTM SE 94), (such as DIN/IIW wires) is permissible. However, the thickness sensitivity and hole sensitivity shall be equivalent to those required by the applicable ASME Code, and prior approval shall be obtained from COMPANY.
- Suitable film density shall be used.
- Radiography of welds in NPS 2½ pipe or smaller may be performed by the elliptical projection technique. At least two separate exposures are required at locations 90 degrees apart.

6.3 MAGNETIC PARTICLE EXAMINATION

Following are additional requirements for magnetic particle examination:

- Only the yoke method shall be used after final postweld heat treatment.
- Permanent magnets or yokes shall be used on air-hardening steels.
- In examination by the prod method, the control switch shall be built into the prod handles, so as to prevent arcing.
- Severe arc strikes resulting from magnetic particle examination shall be removed by grinding and the area subject to 100% MPI or DPI.
- Magnetic particle inspection shall not be used on 5 through 9 percent nickel steels.

6.4 LIQUID PENETRANT EXAMINATION

Following are additional requirements for liquid penetrant examination:

- Except for piping, liquid penetrant shall only be used for non-magnetic materials and 5 through 9 percent nickel steels, unless otherwise approved by COMPANY.
- Cleaning and developing solutions with a combined total residual sulfur and halogen content of one percent by weight or greater shall not be used.

6.5 ULTRASONIC EXAMINATION

Following are additional requirements for ultrasonic examination:

- The weld shall be examined from at least two different probe angles.
- Welds are not acceptable if the echoes from discontinuities exceed the reference curve. Each weld groove face shall be completely examined from both sides of the joint. If,

however, complete examination can be performed from one side only, echoes that exceed 50 percent of the reference curve are not acceptable. Echoes exceeding 20 percent of the reference curve shall be fully evaluated and accurately sized.

- All echoes from discontinuities that exceed 50 percent of the reference curve shall be recorded in the examination report and transmitted to COMPANY. This record shall locate each area, the echo height, the dimensions, the depth below the surface, and the classification.

6.6 EXTENT OF INSPECTION

The minimum inspection shall be as follows:

- All welds shall be visually inspected after completion and inspected per the construction code and this specification.
- For piping, the extent and type of examination shall be as required in accordance with reference Codes and Standards.
 - All final non-destructive examinations shall be performed after post weld heat treatment, unless otherwise approved by COMPANY. Final radiography or ultrasonic examination for vessels shall be performed no sooner than 48 hours after the vessel has cooled to ambient temperature. In special cases, based on equipment type, materials, and process conditions, NDE examination may be separated; some performed before PWHT and some after.
 - Where COMPANY allows non-destructive examination to be performed before the final post weld heat treatment, the welds shall also be examined on all accessible surfaces by the magnetic particle method (dye penetrant method for non-magnetic materials and all piping) after PWHT.
 - The attachment welds between structural components and pressure parts of quenched and tempered carbon steel, HSLA steel, and ferritic alloy materials shall be examined by the magnetic particle method (dye penetrant for piping) after PWHT. This requirement does not apply to 5 through 9 percent nickel steels.
 - All pressure-containing equipment designed with 100 percent joint efficiency, irrespective of material, shall have all nozzle and reinforcing pad attachment welds examined by the magnetic particle or liquid penetrant method, as applicable. Inspection shall be performed on all accessible weld surfaces (inside and outside).

- After completion of welding. This final inspection shall be made after post weld heat treatment, if any.
- When examination by radiography is specified but is not practical, ultrasonic examination or an alternative non-destructive test method shall be proposed for COMPANY approval.
- For all piping and heater coils requiring radiography, the minimum number of shots per circumferential seam shall be as follows:
 - a) Up to and including NPS 2 1/2 diameter: two shots (90 degrees apart)
 - b) Over 2 1/2 NPS diameter: three shots (120 degrees apart)
- Where random non-destructive examination is specified, at least one weld shall be examined for every material grouping, each welding process, and each welder. For each weld found to be defective, two additional representative welds shall be examined. If these additional welds are free from defects, only the defects indicated in the first examination shall be repaired and re-examined. However, if either of the two additional welds shows defects, all welds represented shall be either (1) fully examined and repaired as necessary, or (2) completely replaced.
- For spot radiography, at least one of each type and position of weld made by each welder shall be examined.

6.7 HARDNESS TESTS

The hardness of welds and HAZ, when used in the as-welded condition or after post weld heat treatment, shall not exceed with reference Codes and Standards.

Where the following conditions occur, hardness tests of P-1 and P-3 materials shall be taken on the center of the inside surface of weld seams, where possible; otherwise, on the outside surface of the weld seams at the weld center line and also the HAZ interface between the weld metal and base material. (Including nozzle, manhole, and attachment welds):

- a) Submerged arc welding is performed with F70 or higher flux classification.
- b) Shielded metal arc welding is performed with covered electrodes of E80XX or higher classification.
- c) Filler metal contains at least 1.6 percent manganese, or when manganese and silicon exceed 1.4 and 0.8 percent, respectively.
- d) For carbon steel in critical service, such as wet H₂S, amine, HF, and caustic, the hardness of deposited weld metal shall not exceed 200 HB.

7.0 REJECTION AND REPAIR

Defects that are outside the limits of the codes, job specifications, or other requirements stated on the purchase order shall be cause for rejection. The CONTRACTOR / SUPPLIER shall provide rectification procedures and take such remedial action as is necessary to re-establish the weld integrity and acceptance by COMPANY. The cost of the remedial action shall be borne by the CONTRACTOR / SUPPLIER. The CONTRACTOR / SUPPLIER shall only attempt 2 repairs of a defective weldment before the complete weld is removed and replaced.

Repairs of major defects, and all repairs in plate or forgings, require prior approval by COMPANY. Repairs of weld defects are considered major when the defect size exceeds one-half the wall thickness and the thickness of the component is over 25.4 mm (1 in); or when the defect resulted in leakage during a hydrostatic test. The repair procedure shall be in writing and shall include information on methods used for defect removal, inspection of cavity, welding procedures, welding techniques and details of non-destructive examination of the excavated and repaired area.

All welds (including weld overlays) that are found by inspection to be unsound or that are deposited by procedures differing from those properly qualified shall be rejected. They shall be completely removed from the equipment and replaced in accordance with an approved procedure or be repaired, subject to COMPANY written approval

Repair of local cavities in overlay welds that penetrate the base metal by more than 10 percent or 4.8 mm (3/16 in), whichever is the smaller, shall include having the base metal re-welded. The welding procedure and materials used shall be compatible with the original base metal.

Removal of defects by chipping, grinding, or gouging shall be done in such a manner as to avoid reducing the adjacent base material thickness. If the adjacent material thickness is reduced, it shall be restored to its original condition. Complete removal of defects shall be verified by non-destructive examination before repair is started. Repair welding shall be performed only by qualified welders using qualified procedures.

When a welder's or welding operator's welding is judged unsatisfactory by COMPANY, the welder shall be removed from the work. All such welding by that welder or operator shall be inspected by non-destructive examination and removed or repaired at CONTRACTOR's / SUPPLIER's expense, as directed by CONSULTANT. The welder may be reassigned after additional training and the completion of satisfactory re-qualification tests, but only with the approval of COMPANY.

7.1 REPAIRS AND ALTERATIONS

All repairs or alterations of existing welded equipment shall be done in accordance with the latest addition of the applicable code for new construction. For pressure vessels, both code and non-code repairs and alterations shall conform to ANSI NB-23.

8.0 WELD IDENTIFICATION

In field and shop welding, each qualified welder or welding operator shall have an identification symbol assigned to him to ensure all production welds are traceable to the welder, WPS and NDE report. The welder shall permanently mark each pressure weld with this identification symbol. If more than one welder welds a joint, each shall apply his symbol in such a manner as to indicate the part of the joint he welded. Alternatively, subject to COMPANY written approval, an accurate record keeping system shall be established and maintained to identify welds and the welders that fabricate them.

9.0 DOCUMENTATION

All CONTRACTOR/SUPPLIER as built data reports for new construction, alteration, and repairs shall be furnished to COMPANY upon completion of the fabrication. Such documentation may include, but not be limited to, the following elements: assembly and spool drawings, welding procedures, heat treating charts, inspection records, and appropriate code documents. For details on as built documentation requirements, refer to specific equipment guides and Contract requirements. CONTRACTOR / SUPPLIER shall provide a typical as built documentation index to CONSULTANT prior to work commencing.

10.0 EXPLANATION OF ABBREVIATIONS

FCAW	Flux Cored Arc Welding
FIN	Ferrite Index Number
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
HAZ	Heat Affected Zone
HB	Brinnell Hardness
HSLA	High Strength, Low Alloy
HV	Vickers Hardness
NDE	Non-Destructive Examination
PWHT	Post Weld Heat Treatment
SAW	Submerged Arc Welding
SMAW	Shielded Metal Arc Welding
WRC	Welding

APPENDIX-A6



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
WRAPPING AND COATING OF UNDERGROUND PIPING
DOC. NO: 0504196-MEC-SP-006

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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Disclaimer

This Specification has been prepared on behalf of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and for the exclusive use of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and is subject to and issued in accordance with the agreement between Petrochemical Engineering Consultants (PEC) and OGDCL. PEC accept no liability or responsibility whatsoever for it in respect of any use of or reliance upon this Specification by any third party.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	AV	SAR	Adeel	Jan 19 th , 2021		

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1. INTRODUCTION

1.1 Scope

This specification covers the general requirements for performing the filed wrapping and coating works for underground / buried carbon steel pipes.

Any deviation from this specification shall be approved in writing by the Company. Failure of Contractor to consult with the Company to clarify any item in the specification will, in no way, relieve the Contractor of his responsibility of satisfactory compliance with these specifications.

1.2 Definitions

Company: OIL & GAS DEVELOPMENT COMPANY LIMITED (OGDCL)
Contractor: The person or persons, firm or Proprietor, whose proposal, has been accepted by the COMPANY for construction, installation / erection, testing and completion of works as mentioned in SOW

1.3 Errors or Omissions

The review and comment by the Company of any Contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Company.

1.4 Deviations

All deviations to this Specification, other related specifications or attachments shall be brought to the knowledge of the Company in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection of the Works shall be with written approval of the Company prior to execution of work. Such deviations shall be shown in the documentation prepared by the Contractor.

1.5 Conflicting Requirements

In the event of any conflict, inconsistency or ambiguity between the Contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Company whose decision shall prevail.

1.6 Reference Codes and Standards

The latest edition of all the referenced codes and standards shall be used.

AWWA C-203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied
AWWA-C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
BS-5493	Code of Practice for Protective Coating of Iron & Steel Structures Against Corrosion
ISO 2808	Paints and Varnishes – Determination of film thickness
ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness - Part 1 Rust grades and preparation grades of uncoated steel substrates after overall removal of previous coatings.

2. MATERIALS

2.1 General

Wrapping materials shall be water proof and suitable for the installation and operating temperatures of the specified service as 60°C maximum.

- Underground Fire Water Piping
- Underground Potable Water Piping
- Underground Closed Drain Piping

2.2 Primer Paste

Primer paste for polyethylene wrapping tape shall consist of butyl based elastomers blended with synthetic resins. This paste shall provide excellent adhesion between the pipe metal and the tape together with effective resistance to any tendency for cathodic dis-bondment.

The Primer Paste shall be suitable for use by either machine or hand brush application. The paste shall be non-toxic, non-polluting and conform to local and national standards.

Recommended material is Polyken Primer # 1027, or Equivalent.

2.3 Inner Wrapping Tape

The inner wrapping tape shall not be less than 25 mils thick (0.6 mm) and provide the main corrosion resistance layer. It shall consist of a polyethylene backing tape with a butyl rubber based adhesive layer to assure high bond efficiency with the primer paste.

The inner wrapping tape shall be principally designed for machine application but shall also permit hand placement.

The tape shall possess excellent conformability with the pipe profile when applied over seamed, spiral, welded or extruded pipe.

The inner wrapping tape shall resist both chemical and electrolytic corrosion.

Recommended material is Polyken # 980 or Equivalent.

2.4 Outer Wrapping Tape

The outer wrapping tape shall not be less than 25 mils thick (0.6 mm) and provide the main mechanical resistance layer. It shall consist of a tough polyethylene backing tape with a very adhesive butyl rubber based layer to assure high bond efficiency with the anticorrosion inner wrapping tape.

The outer wrapping tape shall be principally designed for machine application but shall also permit hand placement.

The tape shall possess excellent conformability with the pipe profile when applied over seamed, spiral welded or extruded pipe.

Recommended material is Polyken # 955 or Equivalent.

2.5 Mastic & Mastic Strip

A combination of mastic strip and mastic adhesive shall be used for hand wrapping field joints for valves, flanges and fittings, elbows and tees (if required). The mastic strip shall be butyl rubber based with excellent high adhesion properties. The mastic shall be the solvent-less type based on butyl rubber. Filler tape can be used.

Recommended material is Polyken # 930 or Equivalent.

3. Handling and storage of materials

All the wrapping materials shall be stored and handled in accordance with the manufacturer's specification.

The piping spools which have been wrapped at the shop shall be handled with care to prevent damage to wrapping tapes during transportation and installation. In case that the wrapped piping spools have to be suspended, belt slings or other adequate measures shall be used.

4. COATING APPLICATION

4.1 Pipe Surface Preparation

Pipe surface shall be cleaned to remove all surface contaminations. Field welds shall be cleaned by hand tool or power tool.

Weld spatters, projections, sharp edges or indentations, burrs shall be ground smooth. Oil, grease, and other contaminants shall be removed by a suitable solvent or detergent. Salt contamination, chemical cleaning agents and remaining detergents shall be washed off using potable water.

Cleaned field welds do not require paint priming before the application of the tape primer and wrapping.

4.2 Application of Primer

Immediately after cleaning and surface preparation, brush apply tape primer or with roller spreader in accordance with manufacturer's recommendations. Primer shall be applied to a uniform thickness and shall be free of floods, runs, sags, and drips.

Primer shall be tacky to dry at the time the tape is applied.

4.3 Mastic and Mastic Strip

Masting shall be used where for filling the gaps and molding of the irregular shapes of the piping such as parts around the bolts, flange connection, valves etc.

4.4 Inner Wrapping

Inner wrapping shall be applied while the primer is tacky to dry at the time is applied. Tape shall be applied spirally with a minimum overlap of 55% with tension maintained to keep its uniform wrapping and prevent blisters or wrinkles during the wrapping operation.

Wrinkles and voids under the tape during angle changes shall be avoided by varying the tension used on the tape.

4.5 Outer Wrapping

The outer wrapping shall be applied in the same manner as the inner wrap, except the spiral shall be in the counter direction.

5. REPAIRS

Small defects or damage on the wrapping shall be repaired as follows:

The outer and inner wraps around the damaged area shall be removed and clean to the bare steel surface. Apply primer immediately to the bare steel surface and patch with the inner wraps while the primer is tacky. The patch shall overlap by at least 100mm on each side over the repair area. Apply primer over the patch area and circumferential area and finish it with the spiral wrap.

When damage to the wrapping has occurred, the tape shall be removed over a distance of minimum one tape width on either side of the damaged section.

Cable connections to piping for cathodic protection systems shall be effectively covered using a molding compound, followed by tape wrapping.

Re-wrapping shall be carried out, using identical tape material from the same Supplier.

APPENDIX-A7



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR

DE-WATERING

DOC. NO: 0504196-CIV-SP-001

ENGINEERING CONSULTANT:



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Disclaimer

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1	Final Issue	<u> </u> HAMZA	<u> </u> HAMMAD	<u> </u> Adeel	Jan 19 th , 2021		

January, 2021

	MARU RETI COMPRESSION	
Doc. No. : 0504196-CIV-SP-001	Standard Specification For Dewatering	Revision No. 1

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1.0 SCOPE OF WORK

The work covered by this section of specification consist of furnishing all plants, labors, materials, equipment and appliances for performing of all operation for pumping, bailing, dewatering and draining water from excavated area of deep foundations. Complete in accordance with this section of specification, drawing and as per direction of Company.

Definitions

- Owner** : Oil & Gas Development Company Limited (OGDCL)
- Engineer/Consultant** : Petrochemical Engineering Consultants
- Contractor** : The Company named as such in the deed.
- Shall/ Must/ Is To Be** : A mandatory requirement
- Should** : A non-mandatory requirement, advisory or Recommendation

2.0 DEWATERING

The Contractor shall make proper arrangements for controlling the inflow of water into the parts of the excavation being worked and during placing of concrete and other works therein and during entire construction work activities and for the collection and disposal of water from any source including dewatering of water.

Contractor shall also provide and make arrangements to prevent water entering into the excavated area from the existing storm water drain, sewer line, water or oil pipes in the vicinity of the job site due to dismantling (breach) and leakage.

All such arrangements may include (but not limited to) the diversion channels, pipes, open jointed and gravel shrouded drains, open pumping, well point system, sheet piling and all such other recognized means and the same shall be submitted by the Contractor in writing including necessary drawings for the approval by the Company.

Dewatering operation for accumulated water shall be carried out by continuous pumping and bailing operation keeping all site of work clear of water down to the lowest level of the excavation. Contractor shall construct all temporary drainage channels, sumps and traps etc.

Proper coir rope shall be wrapped around the pump strainer while dewatering to prevent

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flow of fine particles of soil.

Water pumped from draining sumps shall be discharged into the existing drains, ditches or water courses or as directed by the Company. Further, the Contractor shall remove all sediments, which may accumulate on any land or in any drain, or ditches as a result of this operation. The Contractor shall provide, without any extra payment, temporary pipelines or drain for the satisfactory disposal of this pumped water up to Nallah/Drain or manhole or disposal points as directed by Company.

The Contractor shall at all times have sufficient pumping machinery including all materials, labors, fuel lubricants, spare parts and other contingent stored to keep the excavated trench for foundation dry with arrangements of stand-by capacity for break-down till the completion of work.

The Contractor shall take adequate precautions before the work proceed to ensure that under no circumstances dewatering operation will stop; otherwise the Contractor shall be held fully and wholly responsible for side collapse due to slippage, endangering the existing structure in the vicinity of the job site.

No claim shall be entertained or accepted in case of extra dewatering required to be done due to stoppage of pumps or pumping operation due to any reason whatsoever.

3.0 RESPONSIBILITY

Notwithstanding the approval by the Company of the Contractor's method and temporary works and arrangements, the Contractor shall remain responsible for and shall accept all the risks and liabilities regarding Dewatering Procedure.

APPENDIX-A8



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
ERECTION OF STRUCTURAL STEEL WORK
DOC. NO: 0504196-CIV-SP-002

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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Disclaimer

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January, 2021

	<h2>MARU RETI COMPRESSION</h2>	
Doc. No. : 0504196- CIV-SP-002	Standard Specification For Erection of Structural Steel Work	Revision No. 1

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1.0 GENERAL

1.1 Scope

1.1.1 This specification covers the requirements of erection of structural steelwork, including receipt of the fabricated materials, storing, transportation to the site, erection, alignment, grouting, encasing, final painting and handing over of the completed structure to the Owner/Engineer.

1.1.2 The work to be provided for by the Contractor, unless otherwise specified in the contract, shall include but not be limited to the following:

- a. Furnishing all construction and transport equipment, tools, tackles, consumables, materials, labor, supervision, etc., required for the completion of erection of the structural steelwork.
- b. Preparation of erection scheme, erection drawings, erection sequence and safety procedures or any such documents as may be required by the Owner/Engineer for the safe and expeditious completion of the work.
- c. Receiving, unloading, checking and moving of fabricated materials to storage yard at site, including stacking of the materials at the storage yard in proper sequence/order, and taking adequate precautions so as to avoid damage to the structure or its painting/galvanizing.
- d. Transportation of all fabricated structural steel materials from site storage yard to the erection site, handling, rigging, assembling, welding, bolting, riveting and satisfactory installation of all fabricated structural steel materials in proper location according to approved erection drawings, erection sequence and/or as directed by the Owner/Engineer.
- e. Providing temporary supports, braces or fastenings to the erected structure in order to ensure safety and stability of the structure and site personnel, including providing of suitable temporary approaches/crossovers for transportation and erection of the steel structures.
- f. Checking centerlines, levels of all foundations including checking lines, level, position and plumb of all foundation bolts and pockets. Any defect observed in the foundation shall be brought to the notice of the Owner/Engineer. The Contractor shall fully satisfy

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himself regarding the correctness of foundation before installing the fabricated steel structures on the foundation blocks.

- g. Aligning, plumbing, providing final welding, bolting or riveting and securely fixing of the fabricated steel structures in accordance with the drawings and/or as directed by the Owner/Engineer.
- h. Carrying out modifications of the fabricated steel structures as directed by the Owner/Engineer including but not limited to the following:
 - i) Removal of bends, kinks, twists, etc., for parts damaged during transport and handling.
 - ii) Cutting, chipping, filling, grinding, etc., if required for preparation and finishing of site connections.
 - iii) Reaming of holes for use of higher size rivet or bolt, if required.
 - iv) Welding of connections in place of riveting or bolting for which holes are either not drilled at all or wrongly drilled during fabrication, as directed by the Owner/Engineer.
 - v) Re-fabrication of parts damaged beyond repair during transport and handling or is incorrectly fabricated, as directed by the Owner/Engineer.
 - vi) Fabrication of parts omitted during fabrication by error, or subsequently found necessary.
 - vii) Drilling of holes which are either not drilled at all or are drilled in incorrect location during fabrication.
 - viii) Carrying out tests in accordance with this specification, if directed.
- i. Carrying out minor modifications of the foundations, with regard to possible defects as stated under item (1.2 f) of this Clause.
- j. Applying painting/galvanizing in conformance with the approved painting scheme/specifications, including providing of touch-up paint/galvanizing for structures as directed by the Owner/Engineer.
- k. Preparation of bill of materials, list of bought-out items, etc., required in connection with the erection of the structural steelwork.
- l. Arranging for prompt attendance for all insurance items as necessary.

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m. Arranging for final inspection and handing over of the completed steel structure.

1.1.3 No work under this specification shall be provided for by any agency other than the Contractor, unless specifically mentioned otherwise in the Contract.

1.1.4 This specification shall be read in conjunction with other documents forming the Contract and the following specifications:

a. The relevant specification for Fabrication of Structural Steelwork.

b. The relevant specification for Welding of Structural Steelwork.

c. The relevant specification for Painting and Galvanizing of Structural Steelwork.

d. The relevant specification for Plain and Reinforced Cement Concrete Work.

1.2 Definitions

Owner : Oil & Gas Development Company Limited (OGDCL)

Engineer/Consultant : Petrochemical Engineering Consultants

Contractor : The Company named as such in the deed.

Shall/ Must/ Is To Be : A mandatory requirement

Should : A non-mandatory requirement, advisory or Recommendation

1.3 Errors or Omissions

1.3.1 The review and comment by the Owner/Engineer of any contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

1.3.2 Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Owner/Engineer.

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Doc. No. : 0504196- CIV-SP-002	Standard Specification For Erection of Structural Steel Work	Revision No. 1

1.4 Deviations

All deviations to this Specification, other specifications or attachments shall be brought to the knowledge of the owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the owner prior to execution of the work. Such deviations shall be shown in the documentation prepared by the contractor.

1.5 Conflicting Requirements

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Owner/Engineer whose decision shall prevail.

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2.0 CODES AND STANDARDS

2.1 All work under this specification, unless otherwise specified, shall conform to the requirements of the latest editions and supplements of the British Standard and American standard specifications and codes of practice and in specific cases where the work is not covered by Standard, any other practice as may be specified by the Owner/Engineer shall be followed. For steel fasteners and welding electrodes the standards and codes are listed as follows:

Steel Fasteners

ASTM A31	Specification for steel rivets and bars for rivets, pressure vessels
ASTM A183	Specification for carbon steel track bolts and nuts
ASTM A193M	Specification for alloy steel and stainless steel bolting materials for high temperature service
ASTM A307	Specification for carbon steel bolts and studs, 413.7 MPa tensile strength
ASTM A320M	Specification for alloy steel bolting materials for low temperature service
ASTM A354	Specifications for quenched and tempered alloy steel bolts, studs and other externally threaded fasteners
ASTM A437M	Specification for alloy steel turbine type bolting material specially heat treated for high temperature service
ASTM A489	Specification for carbon steel I bolts
ASTM A502	Specification for steel structural rivets
ASTM A540M	Specification for alloy steel bolting materials for special applications
ASTM C955	Specification for load bearing steel studs, runner, and dressings or dredging for screw application of Gypsum board and metal plastered basis

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ASTM F959	Specification for compressible washer type direct tension indicators for use with structural fasteners
ASTM F436M	Specification for hardened steel washers
ASTM F593	Specifications for stainless steel bolts, hexagonal cap screws and studs
ASTM F594	Specification for stainless steel nuts

Welding Electrodes and Wires

ISO 9453	Soft solder alloys – chemical compositions and forms
ISO 9454	Soft soldering fluxes, classification and requirements part 1
ISO 9455	Soft soldering fluxes test methods
	Part 1 – Determination of non volatile matter
	Part 8 – Determination of zinc content
	Part 11 – Solubility of flux residues
	Part 14 – Assessment of tacriness of flux residues

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3.0 CONFORMITY WITH DESIGNS

- 3.1 The Contractor shall erect the entire fabricated steel structure, align, tie all members, complete all field connection and grout the foundations, all as per the provisions of the approved drawings, this specification and the sequence and the design criteria laid down by the Owner/Engineer. All work shall conform to the provisions of the relevant British Standard and American Standard Specifications and/or the instructions of the Owner/Engineer.

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4.0 ERECTION DRAWINGS AND DOCUMENTS

- 4.1 The Contractor shall prepare and submit for approval, at the discretion of the Owner/Engineer, a method statement which shall outline the procedures to be followed by The Contractor to ensure the stability of the steelwork at all stages of erection, its conformance to the intentions of the design drawings and to the safety requirements at the erection site. The layout of the cranes, their positioning, use of sub-assemblies, possibility of transporting and lifting of the sub-assemblies and stiffening arrangements, if necessary, shall be addressed to in this document.
- 4.2 The method statement shall include, but not be limited, to the following:
- a. Arrangements for scheme management, including co-ordination and the responsibilities and authority of supervisory personnel at all levels.
 - b. Erection sequences, noting the scheduled starting position, or positions if phased construction is required.
 - c. Methods of ensuring stability, at all times, of individual members (including columns) and sub-assemblies, as well as the partially erected structure, use of temporary braces, etc.
 - d. The detailed method of erecting the structure, the erection scheme to ensure safety during various activities such as lifting, unslinging, initial connecting, alignment and final connecting.
 - e. Provisions to prevent falls from height, including safe means of access and safe places of work, special platforms and walkways, arranging to complete permanent walkways early, slung, suspended or other scaffolds, secured ladders, safety harnesses and safety nets.
 - f. Protection from fall of materials, tools and debris by the provision of barriers such as screens, fans and nets.
 - g. The provision of suitable plant (including cranes), tools and equipment of sufficient strength and quality.

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- h. Contingency arrangements, for example, against a breakdown of essential plant, or if components are delivered out of sequence.
 - i. Arrangements for delivery, stacking, storing, movement on site, on-site fabrication or pre-assembly and the siting of offices.
 - j. Details of site features, layout and access, with notes on how they may affect proposed arrangements and methods of working.
- 4.3 Approved arrangement and erection drawings, specifications and instructions accompanying them shall be followed in erecting structural steelwork. Erection drawings for structural steelwork shall be prepared by the Contractor and shall consist of line diagrams showing every member in position with the respective erection mark.
- 4.4 All steelwork shall be erected with erection marks in the same relative position as shown on the plan or elevation.
- 4.5 Any discrepancy between drawings and specifications shall be brought immediately to the attention of the Owner/Engineer for his decision.

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5.0 MATERIALS

- 5.1 All materials shall be new and unused and shall conform to this specification for Fabrication of Structural Steelwork.
- 5.2 In addition, all other materials such as oxygen, acetylene, paints, fuels, lubricants, oil, grease, cement, sand, aggregate and grout material which are necessary for the execution of the work shall be supplied by Contractor and shall be in accordance with the provisions of the Contract specifications.

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6.0 STORAGE AND HANDLING OF MATERIALS

6.1 GENERAL

6.1.1 Storage of materials shall be at the Contractor's expense and risk. All material shall be stored as to prevent deterioration and to ensure the preservation of their quality and fitness for use in the work. Any material which has been deteriorated or damaged beyond repair and has become unfit for use shall be removed immediately from the site, failing which, the Owner/Engineer shall be at liberty to get the materials removed by other agency and the cost incurred thereof shall be realized from the Contractor.

6.1.2 General storage requirements on steel, welding consumables and fasteners shall be as per Clause 6.0 of The relevant specification for Fabrication of Structural Steelwork and, in addition, requirements vide Clause 6.2 to 6.4 of this specification shall be complied with.

6.2 YARD

6.2.1 The Contractor shall establish a suitable yard in an approved location at site for storing the fabricated steel structures and other materials. The yard shall have proper facilities like drainage, lighting, suitable access for large cranes, trailers and other heavy equipments. The yard shall be fenced all around with security arrangement and shall be of sufficiently large area to permit systematic storage of the fabricated steel structures without overcrowding and in proper sequence in accordance with the approved programme of work.

6.2.2 The Contractor shall visit the site prior to establishing the yard to acquaint himself with the availability of land and the development necessary by way of filling, drainage, access roads, fences, sheds, etc., all of which shall be carried out by the Contractor at his own cost as directed by the Owner/Engineer.

6.3 COVERED STORE

6.3.1 All field connection materials, paints, cement, etc., shall be stored on well designed racks and platforms off the ground in a properly covered store building to be built at the cost of the Contractor.

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6.4 HANDLING AND STORING OF FABRICATED MATERIALS

- 6.4.1 The fabricated materials on receipt at site shall be carefully unloaded, examined for defects, checked, sorted out for each building and stacked securely on skids above level ground. The ground shall be kept clean and properly drained. Long members, such as columns and chords, shall be supported on skids, placed near enough to prevent excessive stresses and damage.
- 6.4.2 The fabricated materials shall be verified with respect to markings on the marking plan. Any material found damaged or defective shall be stacked separately and the damaged or defective portions shall be identified by painting in distinct color. Such materials shall be dealt with as directed by the Owner/Engineer.
- 6.4.3 The handling and storing of the component parts of a structure shall involve the use of method and appliances so as to prevent twisting, bending or otherwise deforming the metal. No member slightly bent or twisted shall be put in place until the defects are corrected. Members seriously damaged in handling shall be rejected.
- 6.4.4 The straightening of bent edges of plates, angles and other shapes shall be done by methods not likely to produce fracture or other injury. Following the completion of the straightening of a bend or buckle, the surface of the metal shall be carefully inspected by the Contractor for evidence of incipient or other fractures. The Contractor shall immediately report to the Owner/Engineer presence of any such evidence and act according to instructions.

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7.0 QUALITY CONTROL

7.1 Quality control operations shall be as specified vide Clause 10.0 of the relevant specification for Fabrication of Structural Steelwork and, in addition, shall include erection related items of work as given below:

- a. Erection: Lines, levels, grades, plumbs, joint characteristics including tightness of bolts, etc.

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8.0 WORKMANSHIP

8.1 GENERAL

8.1.1 Erection of structural steelwork shall be carried out in accordance with relevant ASTM / BS and in an expeditious manner in conformity with the drawings, specifications and erection procedures as approved by the Owner/Engineer.

8.2 PLANT AND EQUIPMENT

8.2.1 The suitability and adequacy of all erection tools and plant and equipment proposed to be used shall be efficient, dependable, in good working condition and shall have the approval of the Owner/Engineer.

8.3 METHOD AND SEQUENCE OF ERECTION

8.3.1 The method and sequence of erection shall have the prior approval of the Owner/Engineer. The Contractor shall arrange for most economical method and sequence available to him consistent with the Drawings and Specifications and such information as may be furnished to him prior to the execution of the Contract.

8.4 TEMPORARY BRACING

8.4.1 Unless adequate bracing is included as a part of the permanent framing, the Contractor during erection shall install, free of cost to the Owner/Engineer, temporary guys and bracings where needed to secure the framing against all dead loads and wind or seismic forces comparable in intensity to that for which the structure has been designed, acting upon exposed framing, as well as loads due to erection equipment and erection operations. As the work progresses, the steelwork shall be securely fastened.

8.4.2 The responsibility of the Contractor in respect of temporary bracings and guys shall cease when the structural steel is once located, plumbed, leveled, aligned securely fastened and grouted within the tolerances permitted under the Specification and the work completed to the satisfaction of the Owner/Engineer.

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8.4.3 The temporary guys, braces, false work and cribbing shall not be property of the Owner/Engineer and they may be removed immediately upon completion of the steel erection unless agreed arrangements are made.

8.5 SETTING OUT

8.5.1 The Contractor shall be responsible for checking the alignment and levels of foundations and correctness of foundation bolt centers, their projected height above the foundation tops, and the length of threading provided and the provision and fitment of nuts for the foundation bolts. These shall be checked well in advance of starting erection work and the Contractor shall be responsible for any consequences for non-compliance thereof. Discrepancies, if any, shall immediately be brought to the notice of the Owner/Engineer for his advice. Screed bars, shall be used for grouting, if so directed by the Owner, at no extra cost.

8.5.2 The Contractor shall assume full responsibility for the correct setting out of all steelwork and erecting it correctly as per alignment and levels shown on the drawings and plumbing of vertical members within the tolerances allowable under this specification. Notwithstanding any assistance rendered to the Contractor by the Owner/Engineer, if at any time during the progress of the work, any error should appear or arise therein; the Contractor at his own cost shall remove and amend the work to the satisfaction of the Owner/Engineer.

8.5.3 No permanent field connections by riveting, bolting or welding shall be carried out until proper alignment and plumbing has been attained to the satisfaction of the Owner/Engineer.

8.5.4 If anchor bolts are to be inserted in pockets such insertion, leveling, grouting etc., shall be done by the Contractor.

8.6 FIELD CONNECTIONS

8.6.1 General

8.6.1.1 The Contractor shall maintain adequate inventory of fasteners, welding consumables, etc., at the site in order to expedite the erection work and to avoid delays due to short supply of fasteners/welding consumables.

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8.6.1.2 Field riveting, bolting and welding shall be as per Clause 11.18 the relevant specification for Fabrication of Structural Steelwork in addition to the following:

- a) Bolts shall be inserted in such a way that they remain in position under gravity even before fixing the nut. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible materials. When assembled, all joint surfaces, including those adjacent to the washers, shall be free of scales except tight mill scales. They shall be free of dirt, loose scales, burrs, and other defects that would prevent solid seating of the parts.
- b) Holes of erection joints to be rivetted or bolted shall be fitted with temporary bolts and plugs after mounting the structures. The number of temporary bolts and plugs shall not be less than 50% of the total number of holes. In joints where the number of holes is equal to 5 or less, not less than 3 holes shall be temporarily bolted.
- c) Field connection for miscellaneous items such as chequered plates, gratings, handrails, etc. shall be as specified in the drawings and/or shall conform to clause 11.13 to 11.16 of the relevant specification for Fabrication of Structural Steelwork.

8.6.2 Site Splices

8.6.2.1 The numbers and details of site splices shall conform to the shop drawings and/or document clause 11.11 of the relevant specification for Fabrication of Structural Steelwork.

8.6.3 Crane Rails

8.6.3.1 The numbers, location and details of site joints for crane rails shall conform to the drawings and shall be as directed by the Owner/Engineer.

8.6.3.2 The type, procedure, materials and detailing, welding, type electrodes, etc., shall be as specified in the drawings and/or as specified by the Owner/Engineer.

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8.7 CORRECTION OF MISFITS

- 8.7.1 Correction of minor misfits, a reasonable amount of reaming and cutting of excess stock from rivets, repairing of defective shop welds or connections will be considered a legitimate part of the erection work. Correction shall be done only after obtaining specific approval and/or instructions from the Owner/Engineer.
- 8.7.2 Any error in shop work which prevents the proper assembly, fitting and erection of parts shall immediately be reported to the Owner/Engineer for his approval of the method of correction.
- 8.7.3 The erector shall not cut, drill or otherwise alter the work of other trades, or his own work to accommodate other trades, unless such work is clearly specified in the Contract or directed by the Owner/Engineer. Whenever such work is specified, the Contractor shall obtain complete information as to the size, location and number of alterations prior to carrying out any work.

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9.0 SITE FABRICATION

- 9.1 The Contractor shall have adequate arrangement at site for minor fabrication work (such as fabrication of parts omitted during fabrication, re-fabrication of parts damaged beyond repair etc.), repairs, etc., in good working condition to the satisfaction of the Owner/Engineer.
- 9.2 Steelwork fabricated at site shall conform to the requirements vide the relevant specification for Fabrication of Structural Steelwork.

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10.0 GROUTING

10.1 The requirements for materials, procedures and workmanship for grouting shall be as per the relevant specification for Plain and Reinforced Cement Concrete Work and, in addition, the following shall be complied with:

- d) Any grout, which has been mixed for a period longer than half an hour shall not be used in the work.
- e) The grout shall be placed below the base plate and rammed in horizontal directions from each edge until the mortar oozes out through the grout holes provided in the base plate. When it is clear that the centre of base plate has been properly filled, the mortar outside the base plate shall be briefly rammed to ensure compaction below the edges.
- f) The work shall be cured for a period of at least 7 days commencing after 24 hours from the completion of grouting and underpinning operations.

10.2 For multi-storied buildings, the bedding/grouting of stanchion bases shall not be carried out until a sufficient number of bottom lengths of stanchions have been properly aligned, leveled and plumbed and sufficient floor beams are in position; the stanchion bases being supported meanwhile by steel wedges.

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11.0 ENCASING OF STRUCTURAL STEELWORK AND COMPOSITE CONSTRUCTION

11.1 The requirements for materials, procedures and workmanship for encasing of structural steelwork shall be as per the relevant specification for Plain and Reinforced Cement concrete Work.

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12.0 PAINTING AND GALVANISING

- 12.1 The requirements for materials, procedures and workmanship for Painting and Galvanizing of Steel Structures shall conform to the relevant specification.

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13.0 FINAL CLEAN UP

- 13.1 Upon completion of erection, the Contractor shall, at his own expense, remove all false work, rubbish, temporary braces, platforms, structures or any other appurtenances that are unrelated to the final assembled structure.
- 13.2 All minor repairs, touch-up paints, welding or bolting shall be carried out on the final erected structure as directed by the Owner/Engineer, before handing over the site/structure to the Owner/Engineer.

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14.0 INSPECTION AND TESTING, TOLERANCES OF ERECTION AND ACCEPTANCE CRITERIA

14.1 INSPECTION AND TESTING

14.1.1 The Owner/Engineer shall have free access at all reasonable times to the Contractor's works where the erection of steelwork is carried out.

14.1.2 The Contractor shall provide free of charge, such labor, materials, electricity, fuel, water, stores, tools and plant, apparatus, gauge, templates and instruments as may be required by the Owner/Engineer to carry out inspection and/or tests, whenever required, to ascertain that the erection is being carried out in accordance with the specification and approved drawings.

14.1.3 The Contractor shall furnish, install and maintain in a safe operating condition all scaffolding, ladders, walkways, hoists, adequate lighting, etc., necessary for the inspection.

14.1.4 The Contractor shall continually inform the Owner/Engineer of the progress in erection and as to when the erected structure will be ready for inspection. The Contractor shall give well advance notice to the Owner/Engineer of the readiness of the structure/parts of structure for inspection.

14.1.5 The Owner/Engineer has the right to reject any equipment or work which does not conform to the specification or the drawings. Defective work not in accordance with the specifications or the drawings shall be repaired by the Contractor at his own expense.

14.2 TOLERANCES OF ERECTION

14.2.1 The tolerances for erection of steel structures shall conform to the limits stipulated in relevant ASTM /BS codes. The erection tolerances for specific structures such as chimneys, towers, bunkers, structures subject to dynamic loading requiring closer tolerances, etc., shall be as per the relevant British Standard and American Standards and/or as specified by the Owner/Engineer.

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14.2.2 The encasing work, concreting for composite construction, final welding or painting shall be done only after specific approval from the Owner/Engineer with regard to the erection tolerances.

14.3 ACCEPTANCE CRITERIA

14.3.1 When the erected structure complies with the terms of the Contract and is within the tolerance limits stipulated vide Clause 14.2 above, the steelwork will be accepted forthwith and the Owner/Engineer will issue an Acceptance Certificate or other documents as may be necessary.

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15.0 SAFETY AND SECURITY

- 15.1 Safety and security of the structures, site, or the field personnel shall be solely the responsibility of the Contractor. The Contractor shall take all necessary safety measures to prevent mishaps or accidents during site fabrication, transportation and erection.
- 15.2 The Contractor shall strictly abide by the safety regulations stipulated by the Owner/Engineer and safety precautions as per relevant ASTM /BS as applicable.
- 15.3 If so directed by the Owner/Engineer, the Contractor shall prepare and submit for approval, safety procedures, method statement as described in clause 4.1, safety checklists and instructions on safe use of cranes and safe slinging practices, etc. The safety documents shall be followed in strict conformance. The approval of a document or a procedure by the Owner/Engineer does not absolve or dilute the Contractor's responsibilities towards safety precautions. Any liabilities/ injuries/accidents arising due to defective safety practices of the Contractor shall be solely to the Contractor's accounts.
- 15.4 The safety precautions to be taken by the Contractor shall include, but not be limited to the following:
- a. Security personnel shall be employed to guard against theft of structures/equipments from the yard/site and to ensure that no unauthorized person shall enter the site of erection.
 - b. First aid equipment shall be kept at a prominent location of erection work for any magnitude of emergency use.
 - c. Prominent warning boards, signals, fences shall be provided at pits, hazardous locations, electrical sources, etc.
 - d. No unnecessary work shall go on below when erection is in progress above. When some work is to be done at lower levels, adequate protection shall be provided for all workmen engaged.

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- e. Construction sheds/canteens shall be properly located to protect personnel from injuries from falling objects or structures.
- f. Safe and easy approach to all parts of the work shall be provided during site fabrication, erection and inspection of steelwork.
- g. No erection work shall be carried out during night, and also during storm or heavy rains.

APPENDIX-A9



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
FABRICATION OF STRUCTURAL STEEL WORK
DOC. NO: 0504196-CIV-SP-003

ENGINEERING CONSULTANT:



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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	<u> </u> HAMZA	<u> </u> HAMMAD	<u> </u> Adeel	Jan 19 th , 2021		

January, 2021

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1.0 GENERAL

1.1 SCOPE

- 1.1.1 This specification covers the requirements of supply, detailing, fabrication, painting / galvanizing, testing, storing and delivery at site of structural steelwork. This includes the requirements of all types of fixtures like bolts, nuts, washers, foundation and mounting bolts, cap and base plates for columns, stiffeners etc., welding, and any other items as may be required to complete the work.
- 1.1.2 The work to be provided for by the Contractor unless otherwise specified elsewhere in the Contract, shall include, but not be limited to the following:
- a) Furnish all materials labor, tools and plant, power and all consumables required for fabrication at Contractor's workshop and/or at site and supply, all necessary rivets, bolts, nuts, washers and tie rods for connections.
 - b) Preparation of complete detailed fabrication drawings and erection marking drawings required for all the structure covered under the scope of Contract based on design drawings approved by the Owner/Engineer.
 - c) To submit design calculations for joints and connections developed by the Contractor along with detailed fabrication drawings.
 - d) To submit revised design with calculations and detailed fabrication drawings in case any substitution of the designed sections are to be made.
 - e) Fabrication of structural steel work including shop painting/galvanizing, testing and storing as per the requirements of this specification.
 - f) Suitably marked, assembled, insured including loading, transporting from Contractor's workshop to the site, unload and store all fabricated steelwork and field connection materials at site till erection.
 - g) Prepare and furnish detailed bill of materials, drawing office dispatch lists, rivet and bolt lists and any other list of bought out items required in connection with the fabrication and erection of the structural steelwork.
 - h) Maintain necessary facilities at site for modification and repairs of steelwork at site if necessary as may be required to complete the work in accordance with the Contract.
- 1.1.3 No work under this specification will be provided by any agency other than the Contractor, unless specifically mentioned otherwise elsewhere in the Contract.

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1.1.4 This specification shall be read in conjunction with other documents forming the Contract and Specification for Erection of Structural Steelwork.

1.2 DEFINITIONS

Owner : Oil & Gas Development Company Limited (OGDCL)

Engineer/Consultant : Petrochemical Engineering Consultants

Contractor : The Company named as such in the deed.

Shall/ Must/ Is To Be : A mandatory requirement

Should : A non-mandatory requirement, advisory or Recommendation

1.3 ERRORS OR OMISSIONS

1.3.1 The review and comment by the Owner/Engineer of any contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

1.3.2 Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Owner/Engineer.

1.4 DEVIATIONS

All deviations to this Specification, other specifications or attachments shall be brought to the knowledge of the owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the owner prior to execution of the work. Such deviations shall be shown in the documentation prepared by the contractor.

1.5 CONFLICTING REQUIREMENTS

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Owner/Engineer whose decision shall prevail.

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2.0 CODES AND STANDARDS

2.1 All work under this specification, unless otherwise specified, shall conform to the requirements of the latest editions and supplements of the relevant Standard specifications and codes of practice and in specific cases where the work is not covered by Standard, any other practice as may be specified by the Owner/Engineer shall be followed. Some of the main specifications codes are listed as follows:

ASTM A27M	Specification for steel, castings, carbon, for general applications
ASTM A36M	Specification for Structural steel
ASTM A48	Specification for gray iron castings
ASTM A53	Specification for pipe, steel black and hot dipped zinc coated welded and seamless
ASTM A106	Specification for seamless carbon steel pipe for high temperature service
ASTM A108	Specification for steel bars carbon cold finish standard quality
ASTM A148	Specification for steel castings, high strength, for structural purpose
ASTM A242M	Specification for high strength low alloy structural steel
ASTM A283M	Specification for low and intermediate tensile strength carbon steel plates
ASTM A307	Specification for carbon steel bolts and studs 413.7MPa, tensile strength
ASTM F3125	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
ASTM A1008M	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A449	Specification for quench and tempered steel bolts and studs

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ASTM A500	Specification for cold formed welded and seamless carbon steel structural tubing in rounds and shapes
ASTM A501	Specification for hot formed, welded and seamless carbon steel structural tubing
ASTM A514M	Specification for high yield strength quenched and tempered alloy steel plates. Suitable for welding
ASTM A529M	Specification for structural steel with 290 MPa min, yield point (13mm or ½ inch max. thickness)
ASTM A563M	Specification for carbon and alloy steel nuts
ASTM A1011M	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM A572M	Specification for high strength, low alloy columbium vanadium steel of structural quality
ASTM A588M	Specification for high strength low alloy structural steel with 345 MPa max. Yield point up to 100 mm thick
ASTM A606	Specification for steel, sheet and strip, high strength, low alloy, hot rolled and cold rolled, with improved atmospheric corrosion resistance
ASTM A618	Specification for hot formed welded and seamless high strength, low alloy structural tubing
ASTM A666	Specification for austenitic stainless steel, sheet, strip, plate and flat bar
ASTM A668	Specification for steel forgings, carbon and alloy, for general industrial use
ASTM A690M	Specification for high strength low alloy steel H pipes and sheet piling for using marine environment

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3.0 CONFORMITY WITH DESIGNS

- 3.1 The Contractor shall design all connections, supply and fabricate all steelwork and connection materials in accordance with approved design drawings and/or as instructed by the Owner/Engineer keeping in view the maximum utilization of the available sizes and sections of steel materials.

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4.0 SHOP DRAWINGS

- 4.1 The Contractor shall submit progressively for approval, the detailed shop drawings based on the approved design drawings supplied to him. Fabrication shall commence only on review/approval of shop drawings by the Owner/Engineer.
- 4.2 The sequence of submission of the shop drawings shall match the approved fabrication and erection sequence. The review/approval of these drawings shall not relieve the Contractor of his sole responsibility for the completeness and accuracy of fabrication and erection of the structure and fulfilling the complete requirements of the Contract documents. The approval accorded to the drawings will be restricted to the general conformance with design drawings, specifications and will only ensure the correctness of general arrangement for centerline dimensions and levels, section sizes and adequacy of connections. The correctness of all other details like cutting lengths, matching of holes, notch dimensions, match marking, bill of materials, bolt list, etc., will be entirely Contractor's responsibility.
- 4.3 All drawings shall be prepared by the Contractor according to the standards mentioned in bidding document / Owner's standards. Size of drawing sheets, formats, specimen of title block, size of lettering, welding symbols, etc., shall be as specified by the Owner/Engineer. The drawings shall have complete references to arrangement and other interconnecting drawings. All dimensions and other units shall be given in metric system.
- 4.4 The shop drawings submitted shall include but not be limited to the following:
- a) Assembly drawings giving exact sizes of the sections to be used and location/identification marks of various sections.
 - b) Complete shop details with dimensions, levels, material specifications, bill of quantities, bolt lists etc., including billing weights of all sections/items.
 - c) All details regarding bolt/rivet locations, spacing, numbers, grade, etc., and weld details regarding locations, throat size, length, etc.
 - d) Any other detail that may be required for the clarification of the item to be fabricated.
- 4.5 Shop fabrication drawings shall give complete information necessary for fabrication of the various components of the steelwork. They shall also clearly distinguish between site and shop splices, bolting, welding, etc. The drawings shall be done to a conveniently large scale such that all details are adequately and clearly conveyed.

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- 4.6 Welding symbols used on drawings shall be in accordance with ASTM / BS and shall be consistent throughout. Notes on drawing shall clearly specify sequence of welding and suitable welding techniques so as to minimize or reduce locked-up stresses and distortion.
- 4.7 Shop drawings for column bases shall indicate grout holes and spacer bars, where necessary.
- 4.8 Notches, vent holes, drain holes, etc., and of suitable sizes shall be shown on shop drawings to facilitate galvanizing, where applicable.
- 4.9 The Contractor shall be responsible for any alteration of the work due to discrepancies, errors or omissions on the drawings or details generated by him irrespective of whether such drawings are duly approved or not by the Owner/Engineer.

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5.0 MATERIALS

5.1 GENERAL

- 5.1.1 All materials shall be free from imperfections, mill scales, slag intrusions, laminations, pittings, rusts, etc., that may impair their strength, durability and appearance.
- 5.1.2 All steel sections, plates, bolts, electrodes and other materials, unless otherwise specified, shall be as specified on approved design drawings and shall be of tested quality and test certificates in respect of each lot shall be submitted by the Contractor for Owner/Engineer's verification. All material shall be new and unused.
- 5.1.3 If, samples of materials procured by the Contractor are of unacceptable quality, the Contractor shall immediately discontinue use of such material and get fresh samples approved by the Owner/Engineer. Owner/Engineer has the liberty to reject that portion of work utilizing sub-standard/unacceptable quality material.
- 5.1.4 For bought-out items, special accessories and materials of any description, the Contractor shall submit for the approval of the Owner/Engineer, the names of the proposed makers/suppliers, together with the specification of the materials at the bidding stage.
- 5.1.5 If, a deviation from the specification or a substitution of material is sought, the Contractor shall submit written request to the Owner/Engineer along with necessary supporting documents including test results, manufacturer's certificate, etc., allowing reasonable time for evaluation without disruption of construction schedule. In case of any doubt, the Owner/Engineer may ask for additional information, testing or retesting which the Owner/Engineer may feel necessary but not unreasonable, which the Contractor shall carryout at no extra cost to the Owner and with no impact on the construction schedule.

5.2 STEEL

- 5.2.1 All structural steel shall comply with any of the Standard specification as may be applicable:
- Structural Steel (high tensile)
 - Steel tubes for structural purposes
 - Mild steel tubes
 - Structural steel (ordinary quality)

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- Weldable structural steel
- Hollow steel sections for structural use
- Weldable structural steel (medium and high strength qualities)

5.2.2 Unless otherwise specified in drawings, steel to be used for general structural purposes shall conform to standards.

5.2.3 For parts of structure prone to brittle fracture and/or subjected to severe fluctuation of stresses, steel conforming to ASTM / BS, Grade-B shall be used, unless otherwise specified.

5.2.4 Unless otherwise specified in drawings, use of mild steel tubular conforming to ASTM / BS shall be limited to non-structural applications in hand rails and ladders.

5.2.5 In case of imported steel or any other structural steel being used, these shall conform to specifications equivalent to any of the above relevant specifications and shall be approved by the Owner/Engineer.

5.3 ELECTRODES

5.3.1 Electrodes, welding wire and flux shall be as per the relevant specification of ASTM / BS for Welding of Structural Steelwork.

5.4 BOLTS, SCREWS AND NUTS

5.4.1 All bolts, screws, nuts and lock nuts of size range M5 to M36 to relevant specification of ASTM / BS for product Grade C product Grades A & B. Bolts and nuts of size range M42 to M150 shall conform to relevant specification of ASTM / BS

5.4.2 Technical supply conditions for threaded fasteners shall conform to ASTM / BS

5.4.3 Unless specified otherwise, hexagonal head bolts, screws and nuts of proper Grade shall be used.

5.5 WASHERS

5.5.1 The Material for washers shall conform as specified in drawings.

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5.5.2 Plain tapered washers shall be of mild steel, unless specified otherwise. A minimum of two washers shall be supplied with each bolt. All bolts in tension shall be supplied with additional lock nut to suit and/or spring washer as specified in the drawings. Hardened washers shall be used for high strength bolts.

5.5.3 Plain and lock washers shall conform to outside diameter equal to 3 x inside diameter. Tapered Washers for Standard channels and beams shall be in accordance with Heavy washers, if specified, shall conform to. Hardened and tampered washers to be used with high strength bolts shall conform to the strength specified.

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6.0 STORAGE OF MATERIALS

6.1 GENERAL

- 6.1.1 Storage of materials shall be at the Contractor's expense and risk. Any material, which has deteriorated or has been damaged or considered defective, shall not be used.
- 6.1.2 The Contractor shall maintain proper records of receipt/consumption of various types of materials at site of work. The records shall always be accessible to the Owner/Engineer for verification.
- 6.1.3 All materials meant for use shall be stacked separately with easily identifiable marks.
- 6.1.4. If high strength steels are used in the fabrication, each piece of high strength steel shall carry a Manufacturer's identification mark or an original supplier's mark. The Manufacturer's identification mark shall be in accordance with the established identification system which is on record and shall be available for the information of the Owner/Engineer prior to the start of fabrication.

6.2 STEEL

- 6.2.1 The steel to be used in fabrication shall be stored in separate stacks off the ground section-wise and length-wise so that they can be easily inspected at any time.

6.3 ELECTRODES

- 6.3.1 Storage of welding consumables shall be as per the relevant specification of ASTM / BS for Welding of Structural Steelwork.

6.4 BOLTS, NUTS AND WASHERS

- 6.4.1 Bolts, nuts and washers and other fastening materials shall be stored on racks off the ground with a coating of suitable protective oil. These shall be stored in separate gunny bags, boxes or compartments according to diameter, length and quality.

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7.0 STANDARD DIMENSIONS, FORMS AND WEIGHTS

- 7.1 The dimensions, weights and tolerances of all rolled shapes, plates, bolts, nuts, rivets, washers, etc., shall conform to the requirements of the relevant ASTM / BS standards, or in their absence, the equivalent international standards or codes of practice.

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8.0 TESTS AFTER DELIVERY OF MATERIAL

- 8.1 All materials supplied by the Contractor, shall, after delivery at site and at the discretion of the Owner/Engineer, be subjected to any or all of the tests, required by the relevant International standards or codes of practice.

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9.0 REJECTION OF MATERIAL

- 9.1 The Owner/Engineer may reject at his discretion any material, notwithstanding the manufacturer's certificates, on failing to meet the requirements of relevant International standards and codes for testing of materials. He may similarly reject any material, which has deteriorated or corroded, etc., due to improper storage, handling or transport. Defective materials shall not be used and shall be removed from the site by the Contractor at his own expense.

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10.0 QUALITY CONTROL

- 10.1 The Contractor shall establish and maintain quality control procedures for different items of work and materials, to the extent the Owner/Engineer deems necessary, to ensure that the work is performed in accordance with this specification.
- 10.2 In addition to the Contractor's quality control procedures, materials and workmanship shall be subjected to inspection at all times. The Contractor shall co-operate with the Owner/Engineer in permitting access for inspection, is so desired by Owner/Engineer to all places where the work is being done and in providing, free of cost, all necessary help in respect of samples of materials, tools and plants, instrument, labor and materials required to carry out the inspection.
- 10.3 The inspection will be so scheduled as to provide the minimum interruption to the work of the Contractor.
- 10.4 Materials or workmanship not in reasonable conformance with the provisions of this specification may be rejected at any time during the progress of the work.
- 10.5 The quality control procedures shall include but not be limited to the following items of work:
- a) Steel: Quality, manufacturer's test certificates, test reports of representative samples of materials.
 - b) Rivets, bolts, nuts and washer: Material testing, manufacturer's certificates, dimension checks.
 - c) Electrodes: Manufacturer's certificates, weld metal testing certificates.
 - d) Paints: Manufacturer's certificate, physical inspection reports.
 - e) Galvanizing: Tests to determine the weight, thickness and uniformity of coating.

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11.0 WORKMANSHIP

11.1 FABRICATION

11.1.1 All workmanship shall be comparable with the best practice in modern structural shops. Greatest accuracy shall be observed in the fabrication of every part of the work and all similar parts/items shall be strictly interchangeable.

11.1.2 All fabrication of structural steelwork shall be in accordance with relevant International standards and codes, for the tolerances of fabrication of steel.

11.2 STRAIGHTENING MATERIAL

11.2.1 Rolled materials before being worked on or laid-off must be clean, free from kinks, bends, twists or such other distortions and shall be straight within the tolerances as per relevant ASTM / BS.

11.2.2 Material straightening, if necessary, shall be done either by mechanical methods or by localized application of limited amount of heat. Care shall be exercised to ensure that the temperature of the heated zone as measured by approved methods shall not exceed the specified limits.

11.3 SHEARING, GAS CUTTING AND GRINDING

11.3.1 Cutting may be affected by shearing, cropping or sawing. Use of mechanically controlled gas cutting may be permitted for mild steel only. Gas cutting of high tensile steel may also be permitted provided care is taken to leave sufficient metal to be removed by machining so that all metal that has been hardened by flame is removed. Hand flame cutting may be permitted subject to the approval by the Owner/Engineer.

11.3.2 Effective size of all members cut by gas shall be determined by deducting 3 mm from each cut edge.

11.3.3 All sheared, cropped or sawn edge shall be clean, reasonably square and free from distortions and should the Owner/Engineer find it necessary, the edges shall be ground afterwards.

11.3.4 All re-entrant corners shall be shaped notch-free to a radius of at least 12 mm or as specified.

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11.3.5 chipping of angle flanges and edges of plates wherever necessary shall be done without damaging the parent metal. Chipped edges shall be ground to a neat finish and sharp corners and hammered rough faces shall be rounded off.

11.3.6 The edges and ends of all flange plates and web plates of plate girders and built-up columns, of plates forming chords or web members of lattice girders, all cover plates, the ends of all angles, tees, channels and other sections forming the flanges of plate girders and columns, and chords and web members of lattice girders shall be ground to ensure proper contact. Edge preparation for welding may be done by manual/machine controlled flame cutting with edges free of burrs, clean and straight.

Edges shall be ground to ensure proper contact wherever necessary.

11.3.7 The stiffeners shall be ground to fit tightly to the main angles or flanges and webs. Care shall be taken to ensure a full bearing of the stiffeners at the supports and at other points where concentrated load is applied. The ends shall not be drawn or caulked.

11.3.8 The butting surfaces at all joints of girders or columns shall be ground so as to butt in close contact through the finished joint.

11.3.9 The ends of all built-up girders and of all columns shall be ground after the members have been completely assembled. Bearing edges for crane girders, bearing stiffeners, column caps, bases and roof structure connections shall be ground for full contact.

11.4 PLAINING OF EDGES

11.4.1 Plaining or finishing of sheared or cropped edges of plates or shapes or of edges gas cut with a mechanically controlled torch shall not be required, unless it is specifically required by design and called for on the drawings. Surfaces cut with hand-flame shall be ground, unless specifically instructed otherwise by the Owner/Engineer.

11.4.2 Any beveled edge that has been damaged shall be restored within tolerances. Where such restoration involves welding, only the procedure approved by the Owner/Engineer shall be used.

11.5 HOLING

11.5.1 Holes through more than one thickness of material such as column splices, girder flanges,

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etc., shall, where possible, be drilled after the members are assembled and tightly clamped or bolted together. Punching may be permitted before assembly, provided the holes are punched 3mm less in diameter than the required size and reamed after assembly to the full diameter. The thickness of material punched shall not be greater than 16mm.

- 11.5.2 Bolt/rievet holes shall not be punched in dynamically loaded structures, in splices and in high strength steels.
- 11.5.3 In all cases, where holes are drilled in one operation through two or more separable parts, these parts when so specified by the Owner/Engineer, shall be separated after drilling and burrs removed.
- 11.5.4 No holes shall be made by gas cutting process. Use of burning torch or drift pin to enlarge or modify bolt holes shall not be permitted. Holes that must be enlarged to admit the bolts shall be reamed.
- 11.5.5 Holes for bolts/rievets in purlins, side rails, connecting angles and plates, lacing bars roof members and light framing may be formed by punching if the thickness of the material punched is not greater than 12 mm thick, except where required for close tolerance bolts or barrel bolts.
- 11.5.6 Matching holes for rivets and black bolts shall register with each other so that a gauge of 1.5mm or 2.0mm (as the case may be depending on whether the diameter of the rivet/bolt is less than or more than 25mm) less in diameter than the diameter of the hole will pass freely through the assembled members in the direction at right angles to such members. Finished holes shall be not more than 1.5mm or 2mm (as the case may be) in diameter larger than the diameter of the rivet/black bolt passing through them, unless otherwise specified by the Owner/Engineer.
- 11.5.7 Holes for turned and fitted bolts shall be drilled to a diameter equal to the nominal diameter of the shank or barrel subject to H8 tolerance specified in ASTM / BS. Parts to be connected with close tolerance or barrel bolts shall be firmly held together by tacking bolts or clamps and the holes drilled through all the thickness at one operation and subsequently reamed to size. All holes not drilled through all thickness at one operation shall be drilled to a smaller size and reamed out after assembly. Where this is not possible, the parts shall be drilled and reamed separately through hand bushed steel jigs.
- 11.5.8 All punching and sub-punching shall be clean and accurate and all drilling shall be free from burrs.

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11.6 ASSEMBLY AND FIT-UP

- 11.6.1 The component parts shall be assembled and aligned in such a manner that they are neither twisted nor otherwise damaged, and shall be so prepared that the specified cambers, if any, are provided.
- 11.6.2 Whenever practical, clamps, magnets, holding devices or other setting up fixtures shall be used in assembling parts of the structure to avoid tack welding in the groove. If the type of holding device used for fit-up requires welding onto steel, such temporary attachments shall only be made with the approval of the Owner/Engineer and the welding of such attachments shall be made with the same care and procedure as for the permanent weld.
- 11.6.3 In fit-ups where clamps cannot be used, temporary spacer strips shall be used to ensure the correct root gap prior to tack welding and shall be removed in accordance with the requirements in Clause 11.6.7 below.
- 11.6.4 All parts not correctly fitted together shall be cut apart without damaging the parts and shall be rewelded.
- 11.6.5 Electrodes used for tack welds shall be same as electrodes used to complete the weld, in accordance with the approved welding procedure.
- 11.6.6 All tack welds shall be cleaned and ground down to a feather edge at both ends prior to welding of the root pass. Any defective tack welds shall be removed prior to welding of the root pass.
- 11.6.7 Temporary weld attachments, when permitted, shall be finally removed by cutting with a flame torch above the surface of the steel member. The final finish and removal shall be by power grinding to the original plate surface. Gouging out the attachments, such as air arc cutting, below the plate surface will not be permitted. Any damaged area shall be ground at the discretion of the Owner/Engineer, to merge smoothly with the original surface without welding up the damaged area.

11.7 RIVETING

- 11.7.1 Rivets shall be heated uniformly throughout their length, without burning or excessive scaling, and shall be of sufficient length to provide a head of standard dimensions. They shall, when driven, completely fill the holes and, if countersunk, the countersinking shall be fully filled by the rivet, any protrusion of the countersunk head being dressed off flush, if required.

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11.7.2 Riveted members shall have all parts firmly drawn and held together before and during riveting, and special care shall be taken in this respect for all single-riveted connections. For multiple riveted connections, a service bolt shall be provided in every third or fourth hole.

11.7.3 Rivets shall ordinarily be hot driven, in which case their finished heads shall be of approximately hemispherical in shape and shall be of uniform size throughout the work for the same size rivet, full, neatly finished and concentric with the holes. Rivets shall be heated uniformly to a temperature not exceeding 1065 deg.C; they shall not be driven after their temperature has fallen below 540 deg.C.

11.7.4 Rivets shall be driven by power riveters, of either compression or manually operated type, employing pneumatic, hydraulic or electric power. Hand driven rivets shall not be allowed unless in exceptional cases specifically approved by the Owner/Engineer.

11.7.5 All loose, burnt or otherwise defective rivets shall be cut out and replaced and special care shall be taken to inspect all single riveted connections. Special care shall also be taken in heating and driving long rivets. The Contractor shall prove the quality of riveting by cutting some rivets chosen at random by the Owner/Engineer. No extra payment will be made to the Contractor for such cutting and replacing to the extent of ten sound rivet per five hundred done. Riveting work, for any particular section or group, will be considered satisfactory when at least 90% of the corresponding cut rivets are found to be sound. If the ratio is below 75%, all the rivets in the particular section or group shall be cut, removed and replaced and tested again at the Contractor's expense. For cases between 75% and 90% the Owner/Engineer shall have the option to instruct cutting and replacing any number of further rivets at the Contractor's cost as he deems necessary.

11.8 BOLTING

11.8.1 Where necessary, washers shall be tapered or otherwise suitably shaped to give the bolt contact surfaces satisfactory bearing. Bolt heads and nuts shall rest squarely against the metal.

11.8.2 Bolt lengths shall be such that the threaded portion of each bolt projects through the nut by at least one thread. Also, the bolt projection beyond the nut shall not be more than 6mm.

11.8.3 All connections subjected to vibrating and tensile loads shall be provided with one spring washer and/or lock nuts as may be specified in drawings.

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11.8.4 In all cases where the full bearing area of the bolt is to be developed, the bolt shall be provided with a washer of sufficient thickness under the nut to avoid any threaded portion of the bolt being within the thickness of the parts bolted together.

11.8.5 Bolts shall be inserted accurately into the holes without damaging the thread. Bolt heads and nuts shall be drawn tight against the work with a suitable wrench. Bolt and heads shall be tapped with a hammer while the nut is being tightened. After having been finally tightened, the nuts shall be secured locked with locknuts, where specified.

11.8.6 HIGH STRENGTH FRICTION GRIP BOLTS

- a) The assembly of high strength friction grip bolts shall be as specified ASTM / BS
- b) All contact surfaces shall be grit blasted or cleaned by any other method approved by the Owner/Engineer so as to achieve the necessary slip coefficient specified in the design drawings. If so required by the Owner/Engineer, the joints shall be tested by approved method to determine the slip coefficient of the joint.
- c) The bolts shall be tightened with 'turn-of-nut' method and a hardened washer conforming to ASTM / BS shall be placed below the rotating part.
- d) The deviations in dimensions shall be adjusted by chamfering or by providing pack plates in order to ensure complete contact between the faying surfaces.

11.8.7 FIELD BOLTS

Field bolts shall be supplied by the Contractor in excess of the nominal numbers required, by the following numbers at no extra cost.

From 1 to 50 nos.	:	Minimum of 5 nos additional
From 51 to 500 nos.	:	10% but not less than 10 nos. additional
Over 500 nos.	:	5% but not less than 50 nos. additional

11.9 WELDING

11.9.1 Welding of structural steelwork shall be done as per its relevant ASTM / BS specifications.

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11.10 MACHINING OF BUTTS, CAPS AND BASES

11.10.1 Machining of parts of structural components, if specified on approved drawings, shall be done as stated below:

- a) Column splices and butt joints of struts and compression members shall be accurately machined and close-butted over the whole section with a clearance not exceeding 0.2mm locally at any place.
- b) In column caps and bases, the ends of shafts together with the attached gussets, angles, channels, etc, after connecting together should be accurately machined so that the parts connected butt over the entire surface of contact. Care shall be taken that these gussets, connecting angles or channels, etc., are fixed with such accuracy that they are not reduced in thickness by machining by more than 1mm. A bearing face which is to be grouted direct to a foundation need not be machined if such face is true and parallel to the upper face.
- c) Ends of bearing stiffeners shall be machined to fit tightly at both top and bottom.

11.11 SPLICES

11.11.1 The number of shop/site splices and their location shall be dictated by the design function of the member(s) under consideration and shall be as shown on approved drawings or as approved by the Owner/Engineer.

11.11.2 Generally, the following guidelines may be adopted in preparing fabrication drawings for beams requiring splicing.

- a) In cantilever beams, there shall be no splice located closer to the point of support than one-half the cantilevered length.
- b) For beams employed in any span between supports, there shall be no splice in the centre one-fourth of the span distance nor in one eight segment of the beam nearest any support.
- c) No two splices shall be located closer together than two times the beam depth, or a minimum of one (1) meter whichever is smaller.

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- d) Splices in floor beams must be staggered i.e, the splices in any two adjacent beams shall not lie in a line perpendicular to the beam axis.

11.12 CRANE RAILS

11.12.1 The rails shall be free from twists and the camber shall not exceed 0.2 percent of length. The rails shall be straight and deviation from straightness shall not exceed $\pm 1.5\text{mm}$

11.12.2 Rail joints shall overlap the joints of the gantry girder by a minimum distance of 600mm. Joints in one crane rail shall be staggered to the joint in the opposite crane rail.

11.13 GRATING

11.13.1 Unless otherwise indicated on the design drawings, grating shall be welded steel floor grating. Top surface of bearing bars shall be serrated wherever indicated on the drawings for "Non-slip Surface".

11.13.2 Junctions between bearing and cross bars shall be fully fused without reduction in the areas of the bearing bars.

11.13.3 All cutouts for columns, bracing connections, piping and other openings in grating shall be shop banded with toe plate with bars at least equivalent to grating bearing bars. Shop banding shall also be furnished at ends of bearing bars at ladder and stair landings. Additional banding requirements, if applicable, shall be as designated on the design drawings.

11.13.4 Gratings shall be securely fastened to support members by tack welding or clips as shown on drawings or as directed by the Owner/Engineer.

11.13.5 Removable grating panels shall be fastened to support members by suitable fasteners shown on drawings. Two fasteners per panel shall be used at each support with a minimum of four per panel. Main bars and cross-bars of adjacent sections shall be in line.

11.13.6 Joints in bar grating shall occur only at points of structural support.

11.13.7 Each tread, and the edge of platform at the top of stairs shall be furnished with a non-skid, cast abrasive nosing or as mentioned in the drawings. Nosing shall be installed after painting or galvanizing.

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11.14 FLOOR PLATE

11.14.1 Joints in floor plate shall occur only at points of structural support. Joints of adjacent floor plates shall be staggered by at least 300 mm.

11.14.2 Galvanized floor plates and removable panels of painted floor plate shall be fastened with 8mm diameter galvanized steel countersunk head self-tapping screws. Such plating shall be shop drilled with 10mm diameter countersunk holes at 600mm minimum centers around perimeter and over supports.

11.14.3 Painted floor plate shall be either bolted in accordance with Clause 11.14.2 above or field welded as per general notes on design drawings.

11.15 LACING BARS, BATTEN PLATES AND TIE PLATES

11.15.1 The ends of these members shall be neat and free from burrs.

11.16 HANDRAILING

11.16.1 Handrails and toe plates terminating at structural column shall be field welded, unless otherwise detailed on the design drawings.

11.16.2 Toe plates shall extend continuously around edges of all platforms, landings, and openings except at stair and ladder accesses.

11.16.3 Toe plates shall extend around columns and shall have 25mm minimum clearance from column or from column fireproofing.

11.16.4 All rough edges on handrails and posts shall be removed by grinding or filing. All welds anticipated to come in contact with personnel's hands during normal work operation shall be ground smooth.

11.17 SHOP CONNECTIONS

11.17.1 All shop connections shall be either welded or bolted or riveted as specified on the design drawings.

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11.17.2 Certain connections, specified as shop connection may be changed to field connection by the Owner/Engineer to facilitate erection, and the Contractor shall make the desired changes at no extra cost to the Owner.

11.18 FIELD CONNECTIONS

11.18.1 Field rivets driven at site shall be heated and driven with the same care as those driven in the shop.

11.18.2 Field bolting shall be carried out with the same care as required for shop bolting.

11.18.3 All field assembly and welding shall be executed in accordance with the requirements for shop fabrication excepting such as manifestly apply to shop conditions only. Where the steel has been delivered painted, the paint shall be removed before field welding, for a distance of at least 50mm on either side of joint.

11.19 ENCASING, FIREPROOFING AND COMPOSITE CONSTRUCTION

11.19.1 When encasing or fire proofing of structural shapes is shown in the drawings, the structure shall be unpainted.

11.19.2 Fire proofing work shall be carried out as per the relevant specification ASTM / BS for Fire Proofing of Steel Structures.

11.19.3 Concrete and reinforcement in encasing and composite construction work shall be as per the relevant specification of this document for Plain and Reinforced Cement Concrete Work.

11.20 SHOP ERECTION

11.20.1 The steel work shall be temporarily shop erected complete or as arranged with the Owner/Engineer so that accuracy of fit may be checked before dispatch. The parts shall be shop assembled with sufficient numbers of parallel drifts to bring and keep parts in place.

11.20.2 In the case of parts drilled or punched, through steel jigs with bushes resulting in all similar parts being interchangeable, the steel work may be shop erected in such position as arranged with the Owner/Engineer.

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12.0 INSPECTION AND TESTING, TOLERANCES OF FABRICATION AND ACCEPTANCE CRITERIA

12.1 INSPECTION AND TESTING

12.1.1 The Owner/Engineer shall have free access at all reasonable times to the Contractor's works where the fabrication of steelwork is carried out.

12.1.2 The Contractor shall provide, free of charge, such labor, materials, electricity, fuel, water, stores, tools and plant, apparatus, gauge, templates and instruments as may be required by the Owner/Engineer to carryout inspection and/or tests, whenever required, to ascertain that the fabrication is being carried out in accordance with the specification and approved drawings.

12.1.3 The Contractor shall furnish, install and maintain in a safe operating condition all scaffolding, ladders, walkways, adequate lighting, etc., necessary for the inspection.

12.1.4 The Contractor shall continually inform the Owner/Engineer of the progress in fabrication and as to when individual pieces will be ready for inspection. The Contractor shall give well advance notice to the Owner/Engineer of the readiness of individual pieces for inspection.

12.1.5 Unless directed otherwise, inspection shall be made at the place of Contractor / Sub Contractor prior to dispatch.

12.1.6 The Contractor shall carryout sampling and testing in accordance with the relevant ASTM / BS standards and as supplemented in this specification at his own cost, unless otherwise specified in the Contract. The Contractor shall get the specimens tested in a laboratory approved by the Owner/Engineer and shall submit test results within three (3) days after the completion of the test.

12.1.7 The Owner/Engineer has the right to reject any equipment or work which does not conform to the specification or the drawings. Defective work not in accordance with the Specifications or the drawings shall be redone by the Contractor.

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12.2 TOLERANCES OF FABRICATION

12.2.1 The tolerances on the dimensions of individually rolled steel sections shall be as specified in relevant ASTM / BS. The tolerances on straightness, length, etc., for various fabricated components such as beams, columns, trusses, girders, etc., shall be as per relevant ASTM / BS. Tolerances for special type of structures / part of structure not covered in these codes shall be as specified by the Owner/Engineer.

12.3 ACCEPTANCE CRITERIA

12.3.1 Should any structure or part of structure be found not to comply with any of the provisions of this specification or drawings, the same shall be liable for rejection. No structure or part of the structure, once rejected shall be offered again for inspection, except in cases where the Owner/Engineer considers the defects rectifiable.

12.3.2 When all tests to be performed in the Contractor's shop under the terms of this Contract have been successfully carried out, the steelwork will be accepted forthwith and the Owner/Engineer will issue an acceptance certificate, upon receipt of which, the items can be galvanized / painted assembled and dispatched. No item shall be delivered unless an acceptance certificate for the same has been issued.

12.3.3 The satisfactory completion of tests or the issue of acceptance certificates shall not bind the Owner/Engineer to accept the work, should it, on further tests before or after erection, be found not in compliance with the Contract.

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13.0 PAINTING AND GALVANISING

13.1 Shop / field Painting and Galvanizing of Steel Structures shall be in accordance with its relevant International Specification.

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14.0 MARKING

- 14.1 Each piece shall be distinctly marked before delivery, in accordance with the approved marking diagram and shall bear such other marks as will facilitate erection. For easy identification at site, a small distinguishing mark for each building shall be painted on each end of every member before dispatch from fabrication shop.

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15.0 PACKING

- 15.1 All projecting plates or bars and all ends of members at joints shall be stiffened, all straight bars and plates shall be bundled, all screwed ends and machined surfaces shall be suitably packed and all rivets, bolts, nuts, washers and small loose parts shall be packed separately in boxes so as to prevent damage or distortion during transit.
- 15.2 All packing shall allow for easy removal and checking at site. Special precautions shall be taken against rusting, corrosion, breakage or damage otherwise of the materials.
- 15.3 Each bundle, bale or package delivered under this Contract shall be marked on as many sides as possible by the Contractor and such distinct markings (all previous irrelevant markings being carefully obliterated) shall show the following:
- a) Name and address of the consignee.
 - b) Name and address of the consignor.
 - c) Gross weight of the package in tonnes and its dimensions.
 - d) Identification marks and/or number of the package.
 - e) Custom registration number, if required.
- 15.4 All markings shall be carried out with such materials as would ensure quick drying and indelibility.
- 15.5 Each component or parts or piece of material when shipped, shall be indelibly marked and/or tagged with reference to assembly drawings and corresponding piece numbers.
- 15.6 Each packing case shall contain (in duplicate, in English) a packing list pasted on to the inside of the cover in a water-proof envelope, quoting especially:
- a) Name of the Contractor.
 - b) Number and date of the Contract.

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- c) Name of the office placing the Contract.
 - d) Nomenclature of stores.
 - e) A schedule of parts or pieces, giving the parts or piece number with reference to assembly drawings and the quantity of each.
- 15.7 The dimensions of each package shall not exceed the maximum dimensions permissible for transport over the Railway/Roads.
- 15.8 Notwithstanding anything stated hereinbefore, any loss or damage to the structure or its protective coating resulting from inadequate packing shall be made good by the Contractor at no additional cost to the Owner. The repair of all damages/defects shall be to the satisfaction of the Owner/Engineer. All shipments shall be covered by approved Insurance Policy for transit at the cost of the Contractor.
- 15.9 Necessary advice regarding the shipment with relevant details shall reach the Owner/Engineer well in advance.

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16.0 DESPATCHING

- 16.1 The fabricated steelwork shall be dispatched by the Contractor in such proportions as may be found convenient for erection or as directed by the Owner/Engineer.
- 16.2 The Contractor shall deliver the fabricated structural steel materials to site with all necessary field connection materials in such sequence as will permit the most efficient and economical performance of the erection work. The Owner/Engineer may prescribe or control the sequence of delivery of materials, at his own discretion. Shipping shall be strictly in accordance with the sequence stipulated in the agreed programme.

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17.0 SAFETY

- 17.1 The Contractor shall take all necessary safety measures to prevent mishaps or accidents during fabrication and transportation of approved fabricated items. The Contractor is solely responsible for any damage to property or injury to persons resulting from defective safety measures. Scaffolds and ladders shall conform to the safety requirements of ASTM / BS. Safe and easy approach to all parts of the work shall be provided by the Contractor during fabrication and inspection of fabrication work.

APPENDIX-A10



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR

GROUTING

DOC. NO: 0504196-CIV-SP-004

ENGINEERING CONSULTANT:



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Disclaimer

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1	Final Issue	<u> </u> HAMZA	<u> </u> HAMMAD	<u> </u> Adeel	Jan 19 th , 2021		

January, 2021





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ASTM-C125-79	Standard Definition of Terms Relating to Concrete and Concrete Aggregates
ASTM-C150-78	Standard Specification for Portland Cement
ASTM-C191-79	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM-C531-74	Standard Test Method for Shrinkage and Coefficient of Thermal Expansion of Chemical - Resistant Mortars, Grouts and Monolithic Surfacing.
ASTM-C579- 75	Standard Test Methods for Compressive Strength Surfacing
ASThI-C827-78	Standard Test Method for Early Volume Change of Cementations Mixtures
CRD-C588-79 (Corps of Engineers)	Specification for Nonshrink Grout
AASHTO-T26- 78	Quality of Water to be Used in Concrete
ANSI AIO.9-70	Safety Requirements for Concrete Construction and Masonry-J Work /1

1.4 Delivery, Storage & Handling

- a. Non-shrink Cement - Based Grout and Epoxy Grout aggregate shall be delivered to the site in sound dry bags and Epoxy Grout liquid components in sealed hardener and resin containers. The Contractor shall be responsible for storing the grout in a dry, weatherproof area and within the temperature range of 4 °C to 32°C.
- b. The total job storage time for non-shrink grout shall be limited to ten months.

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2 MATERIALS

2.1 Rules for Selection of Grout Material

The following rules shall govern the selection of grout material to be used:

Non-shrink grouts shall be used for heavy machinery. And shall not be of metallic aggregate type.

Cement sand grout, compressive strength 4000 psi, shall be used for light machinery. Epoxy grouts + other bonding mixture may be used.

For all other situations, ordinary cement grout shall be utilized.

Sand-cement grouts shall be proportioned at the site. All non-shrink grouts shall consist of premeasured, prepackaged materials, supplied by the Manufacturer, except water.

All grouts shall be non-corrosive, non-staining and resistant to effects of moisture.

2.2 Water, Sand and Cement



Potable Water shall be used for all types of concrete work and should be free from organic and inorganic impurities. Tested cubes shall have a minimum of 90% of the 28 days specified strength.

Sand shall be as defined by ASTM C125 and shall conform to ASTM C33, grading for fine aggregates (No. 4 to 100). Sand for bonding mixture shall all pass a No. 16 sieve.

Cement shall be Ordinary Portland Cement, ASTM C150.

2.3 Cement Grouts

Plain Cement Grout shall be two parts sand for every part cement, by weight; with a minimum 28 days compressive stress of 20.70 Mpa (3000 psi) in accordance with ASTM C109.

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2.4 Non-shrink Cement-Based Grout shall meet the following requirements:

PLASTIC VOLUME CHANGE: No shrinkage (0.0%) and a maximum of 4.0% expansion at any time before initial set when tested according to ASTM C827.

HARDENED VOLUME CHANGE: No shrinkage (0.0%) and a minimum of 0.1% expansion in the hardened state when tested according to CRD C588.

COMPRESSIVE STRENGTH: Minimum allowable compressive strength at 28 days to be 40 MPa (6000 psi) as measured by ASTM C109.

INITIAL SET TIME: Not less than 60 minutes when tested according to ASTM C191.

SOUNDNESS: The grout shall contain no metallic substances (catalyzed or non-catalyzed), aluminum powder, water reducing agents, fluidities, accelerators, super plasticizers, or other materials known to increase drying shrinkage Minimum allowable compressive strength at 28 days to be 40 Mpa (6000 psi) as measured by ASTM C109.



2.5 Non-shrink Epoxy Grout shall meet the following requirements:

VOLUME CHANGE: No shrinkage and a maximum of 4.0% expansion when tested according to ASTM C827 (modified).

COMPRESSIVE STRENGTH: Minimum allowable compressive strength at 7 days to be 40 MPa (6000 psi) as measured by ASTM C579.

HEAT DEVELOPMENT: The peak exothermic of a 50 mm (2 in) diameter by 100 mm (4 in) high cylinder of grout not to exceed 35 °C (95 °F) when tested at 24 °C (75 °F) material and laboratory temperatures.

THERMAL EXPANSION: Not to exceed a coefficient of thermal expansion of 54×10^{-6} mm/mm °C (30×10^{-6} in/in/°F) when tested according to ASTM C531.



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2.6 Bonding Mixtures and Adhesives

The following bonding mixture or adhesive can be used to create cohesion or water tightness between new concrete and existing concrete:

Cement Bonding Mixture- Neat cement and water mixed to the consistency of creamy paint.

Epoxy Adhesive- Mixture consists of a proprietary epoxy adhesive, mixed and applied in accordance with Manufacturer's instructions.

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3 EXECUTION

3.1 Surface Preparation

Surface of the existing concrete shall be cleaned of oil, paint and other coatings. The surface shall be roughened to expose the aggregate and thoroughly flushed with clean water.

Before grouting, equipment bases and base plates shall be leveled and aligned in accordance with recommendations of equipment manufacturer and drawings.

When any cement-based grout or bonding mixture is used, the concrete surface shall be thoroughly soaked until absorption stops. Excess water shall be removed just before grouting of bonding.

When epoxy grouts or adhesives are used all surfaces shall be kept dry before application.

3.2 Formwork



Forms or back braces used shall be securely anchored to withstand the forces of the placement of grout.

For non-shrink cement based grout tight forms shall be provided with tape sealed joints. Form oil to be applied for easy form release.

For non-shrink epoxy grout, watertight forms shall be provided with chamfer strips in place where chamfer edge is required. Forms to be lined with polyethylene or heavy wax for easy form release.

3.3 Placement

Grout placement shall be done in a manner that will assure the filling of all surfaces and the intimate contact of grouting materials with surfaces grouted. Grout to be placed rapidly and

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continuously to avoid cold joints under the base-plate. Grouting to be done from one side to the other in one direction with tamping or rodding to eliminate voids.

Grout shall be placed in a manner that does not interfere with the movement of equipment or piping designed for expansion.

3.4 Finishing

Cement-based grout shall be trimmed back to the level indicated after grout has reached an initial set. Surfaces to be sloped away from edges cut back.

Epoxy grout cannot be trimmed after set. Top surfaces shall be finished to proper slope prior to initial set.

Finish coating shall be applied over grout holes and vent holes after grout has set.

3.5 Curing



Immediately after placement, cement-based grout shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury. Grout to be maintained with minimal moisture loss at relatively constant temperature for the period necessary for hydration of cement and hardening of concrete.

Epoxy grout shall be cured in accordance with manufacturer's instructions.

3.6 Shims and Wedges

Removal of shims and wedges is not required unless specified by equipment manufacturer.

All shims or wedges left in place shall be completely encased in grout.

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3.7 Anchor Bolts and Pipe Sleeves

For anchor bolts and pipe sleeves requiring grout, all surfaces shall be cleaned of oil, grease and other foreign substances.

Where anchor bolts or pipe sleeves are to remain isolated, sleeves shall be filled with applicable material such as Silicone Rubber molding compound or other material shown on the drawings.

3.8 Bonding New Concrete to Existing Concrete

The bonding mixture shall be applied by working it into the surface with a stiff brush. New concrete to be placed before bonding mixture dries out.

Epoxy adhesive shall be applied in accordance with manufacturer's instructions.

3.9 Testing

Cement-based grout shall be tested under ASTM C109 and epoxy grout under ASTM C579. Cubes shall be prepared for each type of grout and tested for required compressive strength according to the compressive strength as mentioned for each type of grout

APPENDIX-A11



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR

HDPE GEO-MEMBRANE

DOC. NO: 0504196-CIV-SP-005

ENGINEERING CONSULTANT:



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1 GENERAL

The work under this specification consists of furnishing all labor, Plant, Equipment, Appliances, Material and Fittings etc. For the supply and installation of HDPE Geo-membrane.

1.1 Definitions

- Owner** : Oil & Gas Development Company Limited (OGDCL)
- Engineer/Consultant** : Petrochemical Engineering Consultants
- Contractor** : The Company named as such in the deed.
- Shall/ Must/ Is To Be** : A mandatory requirement
- Should** : A non-mandatory requirement, advisory or Recommendation



2 MATERIALS

The High Density Polyethylene (HDPE) Geo-membranes shall be provided with a textured coating and shall conform to the relevant ASTM standards. The HDPE Geo-membrane shall be free of plasticizers and other leachable additives.

Prior to procurement of the materials, the Contractor shall be required to prepare and submit to the Company for his approval, a complete schedule of materials to be used in the works together with a list of the names and addresses of the manufacturers and the trade names of the materials. The schedule shall include diagrams, drawings and such other technical data as may be required by the Company to satisfy him as to the suitability, durability, quality and usefulness of the material intended to be purchased/used.

The Contractor shall also submit the manufacturer's test certificates. Each roll of geo-membrane shall be labeled with the following information:-

Product Identification Roll Number

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Roll Thickness Roll Dimensions Resin Type
Date of Manufacture

3 SHIPMENT AND STORAGE



Geo-membrane material shall be shipped and stored by appropriate means so that no damage is caused to the material.

The geo-membrane must be shipped free of any factory seams.



Material shall be stored in a secure area to protect it from standing water, soil and vandalism.

4 INSTALLATION

- 4.1 The Contractor shall be responsible for preparing and maintaining the subgrade surface and anchor trenches in a condition suitable for the laying of geo-membrane.
- 4.2 A panel layout shall be provided, prior to installation which will indicate the general panel configuration intended by the liner installer.
- 4.3 As built panel drawings indicating any changes to the panel layout drawings are available upon request.
- 4.4 The method and equipment used to deploy the liner shall not damage the geo-membrane or the supporting subgrade surface.
- 4.5 Wrinkles shall be minimized.
- 4.6 All personal performing seaming operations shall be trained in the operation of the specific seaming equipment being used.

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- 4.7 Double wedge fusion welding shall be primary welding procedure. Extrusion welding will only be used for repairs and detail work.
- 4.8 Installer shall be responsible for determining whether seaming should be restricted or halted due to weather conditions.
- 4.9 Fusion and extrusion welding shall be performed in accordance with the installer's construction quality control manual.
- 4.10 Extrusion rod should be the same type of resin as the geo-membrane.
- 4.11 Trial welds shall be produced in tested at least once every five hours. Additional test shall be performed in cases of inclement weather which affects welding.
- 4.12 Fusion welds shall be non-destructively air pressure tested over the entire length of the seam and shall be in accordance with the Manufacturer's manual.
- 4.13 Extrusion welds shall be non-destructively tested over the length of the seam using the vacuum box method of testing. The testing shall be done in accordance with the Manufacturer's recommendations.
- 4.14 A destructive seam sample will be taken every five hundred lineal feet of seam and tested in peel and shear in a field tensiometer. Seam will be verified by the
- 4.15 installer's laboratory or third party quality assurance laboratory.
- 4.16 All defects and non-passing seam shall be repaired and non-destructively tested in accordance with the Manufacturer's Manual.
- 4.17 In addition to the above, manufacturer's installation manual shall be considered as part of this specification.

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5 PROTECTIVE COVERING

In order to protect and to avoid excessive embrittlement and cracking, the HDPE geo-membrane shall be covered with fine sand and shall then be provided with concrete pavement. The minimum thickness of fine sand covering shall be as specified by the manufacturer.

APPENDIX-A12



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR
PLAIN AND REINFORCED CEMENT CONCRETE WORKS
DOC. NO: 0504196-CIV-SP-006

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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1	Final Issue	<u> </u> HAMZA	<u> </u> HAMMAD	<u> </u> Adeel	Jan 19 th , 2021		

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1.0 GENERAL

1.1 Scope

1.1.1 This specification covers the requirements for general use of plain and reinforced cement concrete work, cast in-situ or precast, in structures including all incidental items of work not shown or specified but reasonably implied or necessary for the completion of the work.

1.1.2 The work to be provided by the contractor, unless otherwise specified, shall include but not be limited to the following :

- a) Furnish all labor, supervision, services including facilities as may be required under statutory labor regulations, materials, forms, templates, supports, scaffolds, approaches, aids, construction equipment, tools and plants, transportation, laying etc., required for the work.
- b) Except where it is excluded from the scope of Contract, Contractor shall prepare progressively and submit for approval detailed design, drawings and Bar Bending Schedules for reinforcement bars showing the positions and details of spacers, supports, chairs, hangers, etc.
- c) Design and prepare working drawings of formworks, scaffolds, supports, etc., and submit for approval.
- d) Submit for approval shop drawings for various inserts, anchors, anchor bolts, pipe sleeves, embedments, hangers, openings, frames, etc.
- e) Submit for approval detailed drawings of supports, templates, hangers, etc., required for installation of various embedments like inserts, anchor bolts, pipe sleeves, frames, joint seals, openings, etc.
- f) Submit for approval detailed schemes of all operations required for executing the work, e.g. material handling, concrete mixing, placement of concrete, compaction, curing, services, approaches, etc.
- g) Design and submission of concrete mix designs required to be adopted on the job, for approval.

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h) Furnish samples and submit for approval the results of tests of various properties of the following :

- i. The various ingredients of concrete.
- ii. Concrete
- iii. Embedments
- iv. Joint seals
- v. Provide all incidental items not shown or specified in particular but reasonably implied or necessary for successful completion of the work in accordance with the drawings, specifications.

1.1.3 No work under this specification shall be provided by any other agency other than the Contractor unless specifically approved by Owner/Engineer in this Contract.

1.2 Definitions

Owner : Oil & Gas Development Company Limited (OGDCL)

Engineer/Consultant : Petrochemical Engineering Consultants

Contractor : The Company named as such in the deed.



Shall/ Must/ Is To Be : A mandatory requirement

Should : A non-mandatory requirement, advisory or Recommendation

1.3 Errors or Omissions

1.3.1 The review and comment by the Owner/Engineer of any contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

1.3.2 Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Owner/Engineer.



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1.4 Deviations

All deviations to this Specification, other specifications or attachments shall be brought to the knowledge of the owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the owner prior to execution of the work. Such deviations shall be shown in the documentation prepared by the contractor.

1.5 Conflicting Requirements

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Owner/Engineer whose decision shall prevail.

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2.0 CODES AND STANDARDS

All work under this specification, unless specified otherwise, shall conform to the latest editions and supplements of following or any other Standard Specification and Codes of Practice. In case any particular aspect of work is not specifically covered by Standard Specifications, any other standard practice, as may be specified by the Owner/Engineer, shall be followed:

Aggregates

Concrete aggregates shall conform to the following standards:

ASTM C33	Concrete aggregates
ASTM C330	Light weight aggregates for structural concrete
ASTM C637	Aggregates for radiation shielding concrete
ASTM C332	Light weight aggregates for insulating concrete

Cement



Concrete cement shall conform following standards:

ASTM C150	Portland cement
ASTM C595	Blended hydraulic cement
ACI 318	Various types of cements specified for concrete
ASTM C618	Fly ash or other pozzolana used as admixtures
ASTM C989	Ground granulated blast furnace slag used as an admixture
ASTM C979	Pigment for internally colored cement

Metal reinforcement

Reinforcement and welding of reinforcement to be placed in concrete shall conform to the requirements of following specifications:

ASTM A615M	Deformed and plain billets steel bars
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ASTM A996M	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A706M	Low alloy steel deformed bars
ASTM A767M	Zinc coated (Galvanized) steel bars
ASTM A775M	Epoxy coated reinforcing steel
ASTM A184M	Fabricated deformed steel bar mats
ASTM A1064M	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
BS 4449	Specification for carbon steel bars for the reinforcement of concrete
AWS D 1.1	Structural Steel Welding Practices



Testing

Tests for Material used in concrete shall comply with the applicable standards listed below:

ASTM C31	Practice for making and curing concrete test specimens in the field
ASTM C39	Test method for compressive strength of cylindrical concrete specimen
ASTM C42	Test method for obtaining and testing drill cores and sawed beams of concrete
ASTM C78	Test method for flexural strength of concrete
ASTM C94	Specification for ready-mix concrete
ASTM C172	Practice for sampling freshly mixed concrete
ASTM C192	Practice for making and curing concrete test specimens in laboratory
ASTM C317	Specification for Gypsum concrete
ASTM C496	Test method for splitting tensile strength of cylindrical concrete specimens
ASTM C617	Practice for capping cylindrical concrete specimen
ASTM C685	Specification for concrete made by volumetric batching and continuous mixing

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- ASTM C989 Specification for ground granulated blast furnace slag for use in concrete and mortars.
- ASTM C260 Water reducing admixtures, retarding admixtures, accelerating admixtures, water reducing and retarding admixtures
- ASTM C494 Chemical admixtures for concrete
- ASTM C1017 Chemical admixture for use in producing flowing concrete

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3.0 MATERIALS FOR CONCRETE

3.1 GENERAL

3.1.1 Materials used in plain or reinforced concrete shall be of standard quality conforming to code BS / ASTM Specifications unless stated otherwise. The Contractor shall get all materials approved by the Owner/Engineer prior to its procurement and actual use.

3.1.2 Any material brought to site and not conforming to the specification, and instruction of the Owner/Engineer, will be rejected and the Contractor shall have to remove the same immediately from site at his own cost.

3.1.3 Source for crush should be as per approval of Owner/Engineer prior to its procurement and actual use.

3.1.4 Source for sand should be as per approval of Owner/Engineer prior to its procurement and actual use.

3.2 CEMENT



The cement used shall normally be sulfate resistance (Type V), Ordinary Portland Cement may be used as required if permitted by the Owner/Engineer.

3.3 AGGREGATES

3.3.1 Coarse Aggregate

Coarse aggregates are particles greater than 4.75mm, but generally range between 9.5mm to 37.5mm in diameter. Only Coarse Aggregate from approved quarries shall be used. Aggregate shall be hard, strong, dense, durable, clean and free from veins and adherent coatings. It shall be free from soft, feeble, thin, elongated or laminated pieces and shall be roughly cubical in shape.

3.3.2 Fine Aggregate

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Aggregate smaller than 4.75mm and within the grading limits #200 sieves is termed as Fine Aggregate or Sand. Only Fine Aggregate from approved sources and conforming to ASTM / BS Specification shall be used. Fine aggregates shall be hard, durable, clean and free from adherent coating and organic matter.



- 3.3.3 Aggregate containing harmful materials like iron pyrites, coal, mica, shale, clay, alkali, sea shells, organic impurities, etc., in such quantities as to affect the strength or durability of concrete will be rejected by the Owner/Engineer. In addition, materials which are chemically reactive and might cause corrosion of reinforcement and aggregates shall not be used.

3.4 WATER

- 3.4.1 Water used for concrete shall be clean and free from oil, acid, alkali, organic matter or other harmful matter in such quantities as would affect the concrete in the plastic or hardened state. Potable water shall generally be considered satisfactory for mixing of concrete.
- 3.4.2 The Owner/Engineer may direct the contractor to get the water tested from an approved laboratory before starting the construction work. Tests on water samples shall be carried out and they shall fulfill the guidelines and requirements of ASTM / BS codes. It is contractor's responsibility to carry out the entire tests at their own cost.
- 3.4.3 In case the water contains any oil/organic matter or an excess of acid, alkalies or any injurious amount of salts, etc., beyond the permissible maximum limits specified the Owner/Engineer will refuse to permit its use.
- 3.4.4 Water found satisfactory for mixing is also suitable for curing concrete. However, water used for curing should not produce any objectionable stain or unsightly deposit on the concrete surface. The presence of tannic acid or iron compounds is objectionable.

3.5 ADMIXTURES

- 3.5.1 Admixtures shall be used only with the prior approval of the Owner/Engineer.

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3.5.2 Integral cement water proofing compounds shall be approved by the Owner/Engineer.



3.6 REINFORCEMENT

3.6.1 Mild steel and medium tensile steel bars, High strength deformed steel bars, wires and Hard-drawn steel wire fabric shall conform to the ASTM / BS standards specified by the Owner/Engineer.

3.6.2 Reinforcement shall be as per relevant ASTM / BS specifications as mentioned in the Contract/ Project Drawing/Instructions. All bars above 8 mm diameter shall be of tested quality.

3.6.3 All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which may destroy or reduce the bond.

3.6.4 Welding of reinforcement, if approved by the Owner/Engineer, shall be done in accordance with AWS – D1.4 code or the recommendations of Owner/Engineer.

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4.0 STORAGE OF MATERIALS

4.1 GENERAL

4.1.1 Any material, which has deteriorated or has been damaged or considered defective by the Owner/Engineer shall not be used.

4.2 CEMENT

4.2.1 Sufficient space for storage, with open passages between stacks, shall be arranged by the Contractor to the satisfaction of the Owner/Engineer.

4.2.2 Cement shall be stored off the ground and under cover in dry, leak proof, well-ventilated warehouses at the works in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter.

4.2.3 Cement shall be stored in easily countable stacks with consignment identification marks. Consignments shall be used in the order of their receipts at site. Sub-standard or partly set cement shall not be used and shall be removed from the site, with the knowledge of the Owner/Engineer, as soon as it is detected.



4.3 AGGREGATES

4.3.1 Aggregates shall be stored on steel plates or on concrete or masonry floor surface.

4.3.2 Each size shall be kept separated with steel or concrete or masonry bulk-heads or in separate stacks and sufficient care shall be taken to prevent the material at the edges of the stockpiles from getting intermixed.

4.3.3 Stacks of fine and coarse aggregates shall be kept sufficiently apart with proper arrangements of drainage.

4.3.4 The aggregates shall be stored in easily measurable stacks of suitable depths as may be directed by the Owner/Engineer.

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4.3.5 Coarse aggregate shall normally be separated into the following sizes and stacked separately in properly designed stockpiles:

- a) 150mm to 80mm, 80mm to 40mm, 40mm to 20mm and 20mm to 5mm.
- b) In certain cases it may be necessary to further split the 20mm to 5mm fraction into 20mm to 10mm and 10mm to 5mm fractions.

4.3.6 This separation of coarse aggregates in different size fractions is necessary so that they may be remixed in the desired proportion to arrive at a correct internal grading to produce mix.

4.4 REINFORCEMENT



4.4.1 Reinforcement steel shall be stored consignment-wise and size-wise off the ground and under cover, if desired by the Owner/Engineer.

4.4.2 If specified in drawings/Schedule of Quantities, the reinforcing steel may have to be coated with cement wash before stacking to prevent scale and rust formation in highly corrosive atmosphere.

4.4.3 Steel reinforcement shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion.

4.4.4 Contractor will provide MTC's of each lot of steel.

4.4.5 Contractor will arrange laboratory test of each bar size and lot from laboratory approved by Owner/Engineer.

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5.0 CONCRETE

5.1 GRADE OF CONCRETE



- 5.1.1 Concrete grades to be used in different parts of work shall be as shown on the drawing or as per the Owner/Engineer's instructions.
- 5.1.2 Grade of concrete shall be as per TABLE 1 of this specification:.

5.2 PROPORTIONING OF CONCRETE

- 5.2.1 Proportioning of ingredients of concrete shall be made by any of the two following methods.
- a) With preliminary tests by designing the concrete mix. Such concrete shall be called 'Design Mix Concrete'.
 - b) Without preliminary tests by adopting nominal concrete mix. Such concrete shall be called 'Nominal Mix concrete'.
- 5.2.2 Design mix concrete shall be used on all concrete works unless otherwise permitted by the Owner/Engineer. In all cases the proportioning of ingredients and works control shall be adopted for use after the approval of Owner/Engineer.
- 5.2.3 Concrete mixes shall be designed by the Contractor to achieve the strength, durability and workability necessary for the job, by the most economic use of various ingredients.
- 5.2.4 The mix proportioning shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing, so that after compaction it surrounds all reinforcements and completely fills the formwork. When concrete is hardened, it shall have the required strength, durability and surface finish.

5.3 MINIMUM CEMENT CONTENT

- 5.3.1 The minimum cement content for each grade of concrete shall be as given in TABLE 2 of this specification.

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5.4 WATER-CEMENT RATIO

5.4.1 The choice of water-cement ratio in designing a concrete mix will depend on the following:

a) Strength requirement

In case of 'Design Mix Concrete', the water-cement ratio of such value as to give acceptable test results shall be selected by trial and error. The values of water-cement ratios for different grades and mix designs shall be established after conducting sufficiently large number of preliminary tests in the laboratory to the satisfaction of the Owner/Engineer.

Following table illustrates the grade of concrete with specified compressive strengths.

TABLE 1 (GRADE OF CONCRETE)

Grade Designation	Specified Characteristic Compressive strength at 28 days (N/mm ²)
M-15	15
M-20	20
M-25	25
M-30	30
M-35	35
M-40	40

Notes :

1. In the designation of concrete mix, letter M refers to the mix and the number to the specified characteristic compressive strength of 15cm cube at 28 days expressed in N/mm².
2. Grades of concrete less than M20 shall not be used in reinforced concrete.





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TABLE 2 (MINIMUM CEMENT CONTENT AND MAXIMUM WATER CEMENT RATIO SPECIFIED FOR DIFFERENT GRADES OF CONCRETE)

Exposure	Plain Concrete			Reinforced Concrete		
	Min. cement content kg/m ³	Max. free water cement ratio	Min. Grade of concrete	Min. cement content kg/m ³	Max. free water cement ratio	Min. Grade of concrete
Mild	220	0.60	-	300	0.55	M20
Moderate	240	0.60	M15	300	0.50	M25
Severe	250	0.50	M20	320	0.45	M30
Very severe	260	0.45	M20	340	0.45	M35
Extreme	280	0.40	M25	360	0.40	M40

Notes :

1. Cement content prescribed in this table is irrespective of the grade of cement and it is inclusive of mineral admixtures. The additions such as fly ash or ground granulated blast furnace slag may be taken in to account in the concrete composition with respect to the cement content and water cement ratio if the suitability is established and as long as the maximum amounts taken in to account do not exceed the limit of pozzolona and slag in the cement.
2. Minimum grade of plain cement concrete under mild exposure condition is not specified.
3. The Contractor shall design the mixes for higher strength over and above those specified in TABLE 2 under Clause 5.1.2 for the various grades of concrete and different slump requirements as per BS EN 1992-1-1:2004+A1:2014
4. Sufficient number of trial mixes (to be decided by the Owner/Engineer) shall be taken at the laboratory for the various designs and graphs of w/c ratio Vs crushing strengths at various ages shall be plotted.



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5. All tests shall be witnessed and the Owner/Engineer will be the final authority to decide upon the adoption of any revised minimum cement content. The Contractor shall always be responsible to produce quality concrete of the required grade.
6. The Owner/Engineer always have the unquestionable right to revise the minimum cement content as decided above, if, in his opinion, there is any chance of deterioration of quality on account of use of lower cement content or any other reason.
7. In case of 'Nominal Mix Concrete', the maximum water-cement ratio for different grades of concrete is specified in TABLE 1.
8. Durability requirement:

BS EN 206:2013 give the maximum water cement ratio permissible from the point of view of durability of concrete subjected to adverse exposure to weather, sulphate attacks, and contact with harmful chemicals. Impermeability may also be an important consideration.
9. However, if the water-cement ratio dictated by durability consideration is lower than that required from strength criterion, the former shall be adopted

5.5 WORKABILITY OF CONCRETE

- 5.5.1 The concrete mix proportion chosen should be such that the concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available.
- 5.5.2 The workability depends on the type and nature of the structure and shall be based on experience and tests. Suggested ranges of values of workability of concrete for some placing conditions are given in TABLE 3 of this specification.
- 5.5.3 Suggested workability in TABLE 3 is for Contractor's guidance only.

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5.5.4 The workability of concrete shall be checked at frequent intervals by slump tests. Alternatively when facilities exist or if required by the Owner/Engineer, the Compacting Factor Test shall be carried out at no extra cost to the Owner.

5.6 SIZE OF COARSE AGGREGATES

5.6.1 The nominal maximum size of coarse aggregate should be as large as possible within the limits specified but in no case greater than one-fourth of the minimum thickness of concrete member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of the form. Reinforced concrete work with aggregates having a normal size of 20mm is generally considered satisfactory.

**TABLE 3
SUGGESTED WORKABILITY FOR DIFFERENT CONDITIONS OF PLACING**

Sr. No.	Placing conditions	Degree of Workability	Workability				Remark
			Vee-Bee Time (Sec)	Compacting Factor	Slump (mm)		
					Min.	Max.	
1.	Concreting of shallow sections with vibration	Very low	20-10	0.75-0.78			Slump is based on 20mm nominal Aggregate size
2.	Concreting of lightly reinforced sections a. with vibration b. without vibration	Low	10-5	0.80-0.85	25	50	
		Medium	5-2	0.85-0.92	25	75	
3.	Concreting of heavily reinforced sections with vibration	Medium	5-2	0.85-0.92	50	75	
4.	Concreting of heavily reinforced sections without vibration, not normally suitable for vibration	High	-	> 0.92	75	125	

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5.	Very narrow and deep R.C.C structures with congestion due to reinforcement and inserts	High	-	-	100	150	
6.	Large mass concrete structures with heavy compaction equipments, roads and like	Very low	-	-	0	25	



5.6.2 For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of the coarse aggregate should usually be restricted to 5mm less than the minimum clear distance between the main bars or 5mm less than the minimum cover to the reinforcement whichever is smaller.

5.6.3 The maximum size of coarse aggregates for different locations shall be as follows unless otherwise specified in drawing or directed by the Owner/Engineer.

- | | |
|--|--------|
| a) Very narrow space | 12 mm |
| b) Reinforced concrete except foundation | 20 mm |
| c) Ordinary Plain concrete and reinforced concrete foundations | 40 mm |
| d) Mass concrete | 80 mm |
| e) Mass concrete in very large structure | 150 mm |

5.7 MIXING OF CONCRETE

5.7.1 Concrete shall always be mixed in mechanical mixer.

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5.7.2 Batching Plants with weigh batching system, where used shall conform to International standards.

5.7.3 Water shall not normally be charged into the drum of the mixer until all the cement and aggregates constituting the batch are already in the drum and mixed for at least one minute.

5.7.4 Mixing of each batch shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency, but in no case shall mixing be done for less than 2 (two) minutes and at least 40 (forty) revolutions after all the materials and water are in the drum.

5.7.5 Mixers shall **not be loaded above their rated capacity as this prevents thorough mixing.**

5.7.6 The entire contents of the drum shall be discharged before the ingredients for the next batch are fed into the drum. No partly set or excessively wet concrete shall be used and such concrete shall be immediately removed from the site. Each time the work stops, the mixer shall be thoroughly cleaned and when the next mixing commences, the first batch shall have 10% additional cement at no extra cost to the Owner/Engineer to allow for loss in the drum.



5.7.7 If there is segregation after unloading from the mixer, the concrete should be rejected.

5.7.8 The mixed concrete shall be used within 30 minutes for ordinary Portland cement and 15 minutes for rapid hardening cement, from the time of adding water.

5.8 CONVEYING OF CONCRETE

5.8.1 Concrete shall be transported from the mixer to the formwork as rapidly as possible by methods which will prevent the segregation or loss of any of the ingredients and maintaining the required workability.

5.8.2 During hot or cold weather, if directed by Owner/Engineer, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather shall also be adopted.

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ACI 306 defines cold weather as "a period when, for more than 3 consecutive days, the following conditions exist:

- 1) The average daily air temperature is less than 40°F (4 °C).
- 2) The air temperature is not greater than 50°F (10 °C) for more than one-half of any 24-hour period.

ACI 305 defines hot weather as "any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and the rate of cement hydration or otherwise causing detrimental results."

ACI 305 lists the following conditions as important factors in hot weather concrete placements: high ambient temperature, high concrete temperature, low relative humidity, wind speed.

According to section R5.13 in the ACI 318 commentary cites recommendations for hot-weather concreting that are given in ACI 305R-91, "Hot-Weather Concreting." at some temperature between about 75 and 100 °F (24 and 38 °C) there is a limit that will be found to be most favorable for best results in each hot weather operation, OR



According to ASTM C 1064-17 typical ranges for hot weather lies in 80 and 95 °F (26 and 35 °C).

- 5.8.3 For long distance haulage, if directed by the Owner/Engineer, transit mixtures, agitator cars of approved design shall be used. .



5.9 PLACING OF CONCRETE

- 5.9.1 The concrete shall be deposited neatly as practicable as possible in its final position to avoid re-handling. Care shall be taken to avoid displacement of reinforcement or movement of formwork.

- 5.9.2 The concrete shall be placed and compacted before initial setting commences and should not be subsequently disturbed. Mixed concrete that has been left standing shall not be used after the initial set has commenced and the addition of water (or cement) to make such a mix more workable shall not be allowed.

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- 5.9.3 Before laying the concrete, the sub-base shall be cleared of all foreign matter, watered and well compacted.
- 5.9.4 Formwork, reinforcement, preparation of surface, embedments, joint seals etc., shall be approved in writing by the Owner/Engineer before concrete is placed.
- 5.9.5 Concrete shall be placed in the formwork by concrete pump or means approved by the Owner/Engineer and shall not be dropped from a height or handled in a manner which may cause segregation. Any drop over 1.5m shall have to be approved by the Owner/Engineer.
- 5.9.6 Formwork shall be cleaned thoroughly and smeared lightly with form oil or approved equivalent just prior to placement.
- 5.9.7 Rock foundation or construction joint shall be kept moist for at least 12 hours prior to placement. Concrete shall be placed always against moist surface but never on pools of water. In case the foundation cannot be dewatered completely, special procedure and precaution, as directed by the Owner/Engineer will have to be adopted.
- 5.9.8 A layer of mortar of thickness 12mm of the same or less w/c ratio and the same proportion as that of the concrete being placed and cement slurry will be spread thoroughly on the rock foundation or construction joint just prior to placement of concrete. The cost of application of such cement slurry and mortar will be deemed to be included in the unit rate of concrete.
- 5.9.9 In foundation trenches or such other situations, the entire concrete used in the work shall be laid gently (not thrown) in layers not exceeding 150mm.
- 5.9.10 In deep trenches or such other situations, the concrete shall be placed through chutes and as directed by the Owner/Engineer. The chute plants shall be of such size and design as to ensure practically continuous flow in the chute. The delivery end of the chute shall be as close as possible to the point of deposit.
- 5.9.11 Rate of placement of concrete shall be such that no cold joint is formed and fresh concrete is placed always against green concrete which is still plastic and workable.

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5.9.12 During rains, concrete shall not be placed in open. No placement in the open is to be tempted unless sufficient tarpaulins or other similar protective arrangement for completely covering the still green concrete from rain is kept at the site of placement. If there has been any sign of washing of cement and sand, the entire affected concrete shall be removed immediately. Suitable precautions shall be taken in advance to guard against rains before leaving the fresh concrete unattended. No accumulation of water shall be permitted on or around freshly laid concrete.

5.9.13 Slabs, beams and similar members shall be poured in one operation, unless otherwise instructed by the Owner/Engineer. Moulding, throating, drip course, etc., shall be poured as shown on the drawings or as directed by the Owner/Engineer. Holes shall be provided and bolts, sleeves, anchors, fastenings or other fixtures shall be embedded in concrete as shown on the drawings or as directed by the Owner/Engineer. Any deviation in there from shall be set right by the Contractor at his own expense as instructed by the Owner/Engineer.



5.9.14 In case the forms or supports get displaced during or immediately after the placement and bring the concrete surface out of alignment beyond tolerance limits, the Owner/Engineer may direct the Contractor to remove the portion affected and reconstruct or repair the same at no extra cost to the Owner.

5.9.15 The Owner/Engineer shall decide upon the time interval between two placements of concrete of different ages coming in contact with each other, taking into consideration the degree of maturity of the older concrete, shrinkage heat dissipation and the ability of the older concrete to withstand the load imposed upon it by the fresh placement.

5.9.16 Where called out on drawings, the concreting for certain portion of structure (e.g. foundation rafts, equipment bases, slab-beam assembly, etc.) shall be done in single continuous pour. No extra cost shall be payable for continuous pour.

5.10 COMPACTION OF CONCRETE

5.10.1 After concrete has been placed, it shall be spread, if necessary and thoroughly compacted by



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approved mechanical vibration to maximum subsidence without segregation and thoroughly worked around shape.

- 5.10.2 Vibrators shall not be used for pushing concrete into adjoining areas.
- 5.10.3 Vibrators must be operated by experienced workmen and the work carried out as per project specifications and international standards. Over compaction with vibrators leading to segregation shall not be allowed.
- 5.10.4 In thin members with heavy congestion of reinforcement or other embedment, where effective use of internal vibrator, in the opinion of the Owner/Engineer, is doubtful, the Contractor may have to employ form vibrators in addition to immersion vibrators.
- 5.10.5 For slabs and other similar structures, the Contractor will have to employ screed board vibrator.
- 5.10.6 Hand tamping may be allowed in rare cases, subject to the approval of the Owner/Engineer.
- 5.10.7 Care must be taken to ensure that the inserts, fixtures, reinforcement and formwork are not displaced or distorted during consolidation of concrete.
- 5.10.8 The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed.
- 5.10.9 Compaction shall be completed before the initial setting starts, i.e. within 30 minutes for ordinary Portland cement and 15 minutes for rapid hardening cement from addition of water to the dry mixture.
- 5.10.10 Once the concrete is deposited, consolidated and finished in its final position, it shall not be disturbed.

5.11 PROTECTION OF NEWLY PLACED CONCRETE

- 5.11.1 Newly placed concrete shall be protected by approved means from rain.

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5.11.2 Concrete placed below ground level shall be protected against contamination from falling earth during and after placing. Concrete placed in ground containing deleterious substances, shall be protected from contact with such ground, or with water draining from such ground, during placing of concrete and for a period of at least three days or as otherwise instructed by the Owner/Engineer.

5.11.3 The ground water around newly poured concrete shall be kept to an approved level by pumping out or other adequate means of drainage to prevent floatation or flooding.



5.11.4 Steps, as approved by the Owner/Engineer, shall be taken to protect immature concrete from damage by debris, excessive loadings, vibration, abrasion, mixing with earth or other deleterious materials, etc., that may impair the strength and durability of the concrete.

5.12 CURING OF CONCRETE

5.12.1 After the concrete has begun to harden, i.e., about 1 to 2 hours after laying or as directed by the Owner/Engineer, it shall be protected from quick drying by covering with moist gunny bags, sand, hessian, canvas or similar material approved by the Owner/Engineer and kept continuously wet for at least ten days from the date of placing of concrete.

5.12.2 The Contractor shall remain extremely vigilant and employ proper equipment and workmen under able supervision for curing. The Owner/Engineer's decision regarding the adequacy of curing is final. In case any lapse on the part of the Contractor is noticed by the Owner/Engineer, he will inform the Contractor to correct the deficiency in curing. If no satisfactory action is taken by the Contractor within 3 (three) hours of issuance of such instruction, the Owner/Engineer will be at liberty either to employ sufficient means through any agency to make good the deficiency and recover the cost thereof from the Contractor, or pay for the part where inadequate curing was noticed at a reduced rate, entirely at the discretion of the Owner/Engineer.

5.12.3 Curing by continuous sprinkling of water or membrane curing will be allowed if the Owner/Engineer is satisfied with the adequacy of the arrangements made by the Contractor.

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5.12.4 The water to be used for curing should be free from all injurious salts or organic matter.

5.12.5 The temperature of concrete during curing should be kept fairly above freezing point of water; otherwise the rate of hardening will be slow.

5.12.6 The procedure for steam curing or hot water curing, if required as in the case of mass production of precast elements, shall be got approved from the Owner/Engineer. In the case of steam curing, the temperature of steam should be restricted to a maximum of 100⁰C as in the absence of proper humidity (about 90%) the concrete may dry soon. The temperature should be fully controlled to avoid non uniformity and the concrete should be prevented from rapid drying and cooling which may cause cracking.



5.13 CONSTRUCTION JOINTS

5.13.1 Vertical construction joints will be made with rigid stop board forms having slots for allowing passage of reinforcement bars and any other embedments and fixtures that may be shown.

5.13.2 For water retaining structures and leak-proof buildings, suitable and approved quality of water stops shall be installed at the construction joints.

5.13.3 Where the locations of construction joints are not specified, it shall be in accordance with the following subject to the approval of Owner/Engineer:

- a) In a column, the joint shall be formed 75mm below the lowest soffit of the beam framing into it.
- b) Concrete in a beam shall preferably be placed without a joint, but if provision of a joint is unavoidable, the joint, shall be vertical and at the middle of the span where shear force is minimum.
- c) A joint in a suspended floor slab shall be vertical and at the middle of the span and at right angles to the principal reinforcement.

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- d) A construction joint should preferably be placed in a low-stress zone and at right angles to the direction of the principal reinforcement.
- e) Feather-edges in concrete shall be avoided while forming a joint.
- f) In case the Contractor proposes to have a construction joint anywhere to facilitate his work, the proposal should be submitted well in advance to the Owner/Engineer for study and approval without which no construction joint will be allowed.

5.13.4 When the work has to be resumed on a surface which has hardened (i.e. more than 48 hours old), such surface shall be roughened and swept clean and thoroughly wet. For vertical and horizontal joints after roughened the surface apply SBR (carboxylated styrene butadiene copolymer) as a bonding agent of BASF, SIKA, Master Flow or approved equivalent after that surface shall be covered with a layer of mortar about 10 to 15mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing of new concrete.

5.13.5 Where the concrete has not fully hardened (i.e. less than 48 hours old), all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with SBR and then apply neat cement slurry. On this surface, a layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots, work thereafter shall proceed in the normal way.

5.14 COLD JOINT

5.14.1 An advancing face of a concrete pour, which could not be covered by fresh concrete before expiry of initial setting time (due to an unscheduled stoppage or delay on account of breakdown in plants, inclement weather, low rate of placement or any other reason), is called a cold joint.

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5.14.2 The Contractor should always remain vigilant to avoid cold joints. If, however, a cold joint is formed due to unavoidable reasons, the following procedure shall be adopted for treating it:

- a) If the concrete can be removed manually and if vibrators can penetrate the surface without much effort, fresh concrete can be placed directly against the old surface and the joint thoroughly and systematically vibrated.
- b) In case concrete has hardened a bit more than (a) but can still be easily removed by a light hand pick, the surface shall be raked thoroughly and the loose concrete removed completely without disturbing the rest of the concrete in depth. A rich mortar layer 12mm in thickness shall be placed on the cold joint. Fresh concrete shall then be placed on the mortar layer and the joint vibrated thoroughly and systematically penetrating the vibrator deep into the old layer of concrete.
- c) In case the concrete at the joint has become so stiff that it cannot be remoulded and mortar or slurry does not rise in spite of extensive vibration, the joint shall be left to harden and then treated as a regular construction joint, after cutting the concrete to required shape and preparing the surface as described under Clause 5.17.



5.15 EXPANSION JOINTS

5.15.1 Expansion joints shall be provided as shown in the drawings or as indicated by the Owner/Engineer.

5.15.2 The filling of these joints with bitumen filler, bitumen felt, cork or any such material and the provision of copper or brass plate, etc., (as may be specified) will be described and paid for separately.

5.15.3 The expansion joint in roof should be water-tight as well as should allow free movement.

5.15.4 All materials are to be procured from reliable manufacturers and must have the approval of the Owner/Engineer. Where it is the responsibility of the Contractor to supply the materials,

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the Owner/Engineer may demand test certificates for the materials and/or instruct the Contractor to get them tested in an approved laboratory without any extra cost to the Owner.

5.15.5 Bitumen Board

5.15.5.1 Bitumen impregnated fiber board of approved manufacturer as per BS-5628 may be used as fillers for expansion joints. It must be durable, water-proof, and compressible and possess a high degree of rebound. The dimensions of the board should be equal to that of the joint being formed. It should, preferably be manufactured in one piece, matching the dimension of the joint.

5.15.5.2 At the exposed end, the joint shall be sealed with approved sealing compound to a depth of at least 25mm after application of an approved primer. The sealing compound and the primer shall be applied as specified by the manufacturer.



5.15.6 Expanded Polystyrene Boards

5.15.6.1 If specified, commercial quality of expanded polystyrene products commonly used for thermal insulation may also be used as filler material in expansion joints. The thickness may vary from 12mm to 50mm, as approved by the Owner/Engineer.

5.15.6.2 The material will have to be procured from reliable manufacturer approved by the Owner/Engineer. The method of installation will be similar to that recommended by the manufacturers for fixing on cold storage walls. A coat of bitumen may have to be applied, if specified.

5.15.7 Joint sealing Strips

5.15.7.1 Joint sealing strips / water stoppers shall be provided as shown in drawings at the construction, expansion and isolation joints as a continuous diaphragm to contain the filler material and/or to exclude passage of water or any other material into or out of the structure.

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5.15.7.2 The sealing strips will be either metallic like G.I., Aluminum or Copper, or non metallic like Rubber or P.V.C.

5.15.7.3 Sealing strips shall not have any longitudinal joint and shall be procured and installed in largest practicable lengths having a minimum number of transverse joints.

5.15.7.4 The jointing procedure shall be as per the manufacturer's recommendations, and leak proof.

5.15.7.5 If desired by the Owner/Engineer, joints in rubber seals shall have to be vulcanized.

5.15.7.6 Metal sealing strips shall be either G.I, Aluminum or Copper and formed straight, U shaped, Z shaped or any other shape and of thickness as indicated in the drawing /or as instructed by the Owner/Engineer. The transverse joints shall be gas welded using brass rods and approved flux and shall be tested by an approved method to establish that it is leak proof, by the Contractor without any additional cost to the Owner.

a) G.I Strips



G.I. strips shall be minimum 1.5mm thick and 150mm in width unless specified otherwise. The standard of Galvanizing shall be as per ASTM B209 M19 for heavy duty work. At the joints, the overlapping should be for a minimum length of 50mm.

b) Aluminum Strips

Aluminum strips shall be minimum 18 SWG thick and 300mm wide unless specified otherwise and shall conform to ASTM B209 M19 / BS: 1470 and of 19000 grade or 31000 grade A minimum lap length of 50mm is required at the joints.

c) Copper Strips

The Copper strips shall be minimum 18 SWG in thickness and 300mm width unless specified otherwise and shall conform to relevant international or Indian standards. A minimum lap length of 50mm is required at the joints.

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5.15.7.7 Non-metallic sealing strips, normally of rubber or PVC can be of shape having any combination of the following features:

- Plain
- Central bulb
- Dumb-bell of flattened ends
- Ribbed and corrugated wings
- V shaped



As these seals can be easily handled in very large lengths unlike metal strips, transverse joints shall be allowed only under unavoidable circumstances and with the specific approval of the Owner/Engineer. Joints and laps shall be as specified by the manufacturer.

a) Rubber Sealing Strips

The minimum thickness of rubber sealing strips shall be 3mm and the minimum width 100mm. The actual size and shape shall be as shown in drawings/Schedule of Quantities and/or as directed by the Owner/Engineer. The material will be natural rubber and be resistant to corrosion, abrasion and tear and also to attack from the acids, alkalis and chemicals normally encountered in service. The physical properties are given below for Contractor's guidance.

Specific gravity	:	1.1 to 1.15
Shore hardness	:	65A to 75A
Tensile strength	:	25 - 30 N/sq.mm
Maximum safe continuous temperature	:	75 °C
Ultimate elongation	:	Not less than 350%

b) P.V.C sealing strips

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The minimum thickness of P.V.C sealing strips shall be 3mm and the minimum width 100mm. The actual size and shape will be as shown in drawings/Schedule of Quantities and/or as directed by the Owner/Engineer. The material should be of good quality Polyvinyl Chloride highly resistant to tearing, abrasion and corrosion as well as to chemicals likely to come in contact with during use. The physical properties are given below for Contractor's guidance.

Specific gravity	:	1.3 to 1.35
Shore hardness	:	60A to 80A
Tensile strength	:	10-15 N/sq.mm
Maximum safe continuous		
Temperature	:	70 °C
Ultimate elongation	:	Not less than 275%



5.15.7.8 When directed, the gap in expansion joints shall be thoroughly cleaned and bitumen compound laid as per manufacturer's specifications. The compound to be used shall be of approved manufacture and shall conform to the requirements of BS-2499, BS-5212.

5.16 ISOLATION JOINTS

5.16.1 Isolation joints shall be used to separate or isolate concrete slabs from columns, footings or walls. In addition to horizontal movements of the slab caused by shrinkage, they also permit vertical movement that occurs due to differences in unit soil pressure under floors, walls, columns and machinery footings. They should also be used at other points of restraint such as drain pipes, sumps or stairways.

5.16.2 Because isolation joint is used to allow freedom of movement, there should be no connection across the joint by reinforcement, keyways or bond.

5.16.3 An isolation joint between a floor and the wall may be made by attaching a bitumen-impregnated sheet, not more than 6mm thick, to the wall prior to placing of concrete.

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5.17 REPAIRS AND FINISHING UNFORMED CONCRETE SURFACES

5.17.1 Repairs

5.17.1.1 Unsound concrete resulting from improper mixing, incompetent methods, equipment and formwork, poor workmanship and protection will not be accepted and will have to be dismantled, removed and replaced by sound concrete at the Contractor's cost.

5.17.1.2 All concrete work shall be inspected by the Contractor immediately after the forms are removed and he shall promptly report occurrence of any defects to the Owner/Engineer.

5.17.1.3 All repair works shall be carried out as per the instructions and in the presence of the Owner/Engineer.



5.17.1.4 Generally, repair work may consist of any or all of the following operations:

- a) Cutting away the defective concrete to the required depth and shape.
- b) Cleaning of reinforcement and embedments.
- c) Roughening by sand blasting or chipping.
- d) Installing additional reinforcement/welded mesh fabric.
- e) Dry packing with stiff mortar.
- f) Plastering, guniting, shotcreting etc
- g) Placing and compacting concrete in the void left by cutting out defective concrete.
- h) Grouting with cement sand slurry of 1:1 mix.

5.17.2 Finishing Unformed Surface

5.17.2.1 The Contractor is to include in his quoted rate for concrete, the provision of normal finishes in unformed surfaces which can be achieved by screeding, floating, trowelling, etc., as and where required by the Owner without any extra cost to the Owner.

5.17.2.2 A few typical and common cases of treatment of concrete surface are given below:



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- a) Whenever a non-integral floor finish is indicated, the surface of reinforced concrete slab shall be struck off at the specified levels and slopes and shall be finished with a wooden float fairly smooth removing all laitance.
- b) Where monolithic finish is specified or required, concrete shall be compacted and struck, off at the specified levels and slopes with a screed, preferably a vibrating type and then floated with a wooden float. Steel trowelling is then started after the moisture film and shine have disappeared from the surface and after the concrete has hardened enough to prevent excess of fines and water to rise to the surface but not hard enough to prevent proper finishing of aberrations.
- c) To provide a better grip, the Owner/Engineer may instruct marking the floor in a regular geometric pattern after initial trowelling.
- d) If it is intended to apply plaster on any concrete surface or such concrete surfaces against which brickwork or other allied works are to be built, the Contractor shall hack the surface adequately as soon as the form is stripped off so that proper bond can develop. Pattern, adequacy and details of such hacking shall be as directed by the Owner/Engineer.

5.18 MINIMUM COVER TO MAIN REINFORCEMENT

5.18.1 Under normal condition, the following minimum clear cover shall be provided for reinforced concrete works unless otherwise specified in drawings:



- a) Slab (roof & floor), Canopy, : 15mm or dia. of
Projection, waist Slab : bar whichever is greater
- b) Beam (roof, floor & tie) Lintel : 25mm or dia. of bar whichever is greater
- c) Column Pedestal : 40mm.
- d) Retaining wall, Basement and Pit Wall

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- i. Face in contact with earth : 40mm
 - ii. Free face whichever is greater : 15mm or dia. of bar
- e) Liquid retaining structure
- i. Face in contact with liquid bar whichever is greater : 25mm or dia. Of
 - ii. Face away from liquid but in contact with earth : 40mm
 - iii. Free face whichever is greater : 15mm or dia. of bar
- f) Foundation slab, base slab, plinth beam : 50mm
- g) Pile Cap
- i. Bottom face & sides : 100mm
 - ii. Top face : 50mm

5.18.2 Minimum cover to foundation bolts

Minimum distance from the centre line of foundation/anchor bolt to edge of pedestal shall be the maximum of the following unless specified otherwise in drawings:

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- i. Clear distance from the edge of the base plate/base frame to the outer edge of the pedestal shall be minimum 50mm.
- ii. Clear distance from the face of pocket to the outer edge of the pedestal shall be 75mm.
- iii. Clear distance from the edge of the sleeve or anchor plate to the edge of pedestal shall be 75mm.

5.19 LEAN CONCRETE

- 5.19.1 Unless noted otherwise in drawing, mat of minimum 100mm thickness of concrete mix M7.5 (by weight, using 40mm and down size graded crushed stone aggregate) shall be provided under all R.C.C. foundations
- 5.19.2 Mat shall extend 100(minimum) on all sides beyond the edges of base slab in case of liquid retaining/storage structures and 50mm in case of other foundations unless noted otherwise in drawing.
- 5.19.3 Lean concrete of grade 1:5:10 (by volume) or any other material as specified by the Owner/Engineer shall be used as filler material wherever loose sub grade exists by removing the loose soil/fill or where the levels are to be made up to the desired founding level.
- 5.19.4 The minimum cement content (exclusive of permissible wastages), unless otherwise specified in drawings/ Schedule of Quantities, shall be as follows:

Mix Cement content



1:5:10 136 kg/cu.m of finished concrete

1:4:8 170 kg/cu.m of finished concrete

1:3:6 218 kg/cu.m of finished concrete

5.20 PLAIN CEMENT CONCRETE (P.C.C)



- 5.20.1 Unless noted otherwise in drawing, plain cement concrete mat of grade M15 of minimum

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150mm thickness (using 40mm and down size graded crushed stone aggregate) shall be provided under all masonry wall foundations.

5.20.2 Plain cement concrete of grade M15 of 40mm thickness (using 10mm & down size graded aggregates) shall be provided as damp-proof course at plinth level of all masonry wall unless noted otherwise in drawing.

Waterproofing admixture of approved make shall be added with the cement in quantities specified, but not less than 2% by weight of cement. The minimum cement content (inclusive of permissible wastages), unless specified otherwise, shall 407 kg/cu.m of finished concrete.

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6.0 BENDING AND FIXING OF REINFORCEMENT BARS

6.1 GENERAL

6.1.1 Reinforcement bars and plain hard-drawn steel wire fabric shall be as per Clause 3.6 of this specification or as indicated in drawing.

6.2 BENDING AND FIXING

6.2.1 Reinforcement shall be cut, bent and fixed in position in accordance with ASTM 615 M90 or as specified by the Owner/Engineer and shall not be straightened in a manner that will injure the material.

6.2.2 Bends and shapes shall comply strictly with the dimensions corresponding with the approved 'Bar Bending Schedule (B.B.S)'.

6.2.3 When reinforcement bars are bent aside at construction joints and afterwards bent into their original positions, care shall be taken to ensure that at no time is the radius of the bend less than 4 bar diameters for plain mild steel bars or 6 bar diameters for deformed bars. Care shall also be taken when bending back bars, to ensure that the concrete around the bar is not damaged.



6.2.4 Reinforcement bars shall be bent by machine or other approved means producing a gradual and even motion. All the bars shall be cold bent unless otherwise approved.

6.2.5 Bending hot at a cherry-red heat (not exceeding 845 °C) may be allowed under very exceptional circumstances having diameter more than 32mm, except for bars whose strength depends on cold working. Bars bent hot shall not be cooled by quenching.

6.2.6 For such works for which B.B.S is furnished by the Owner/Engineer, the Contractor shall recheck the same, at no extra cost to the Owner, before any bending of bars is done.

6.3 PLACING IN POSITION



6.3.1 All reinforcement shall be placed and maintained in the position with spacing and cover shown in the drawings.

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- 6.3.2 The reinforcement shall be firmly held in position with the help of suitable mild steel chairs, and or concrete spacer blocks.
- 6.3.3 Where mortar blocks are used for ensuring the cover and positioning of reinforcement, they shall be made of 1:2 cement-sand mortars (by volume) and cured in a pond for at least 7 days. The type, size, shape and location of blocks shall be as approved by the Owner/Engineer.
- 6.3.4 Crossing bars should not be tack-welded for assembly of reinforcement unless permitted by the Owner/Engineer.
- 6.3.5 The bars crossing one another should be tied together at every inter-section with two strands of No.20G annealed soft iron wire, twisted tight, to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during the disposition of concrete.
- 6.3.6 The vertical distance between successive layers of bars shall be maintained by provision of mild steel spacer bars. They should be spaced such that the main bars do not sag appreciably between adjacent spacers.
- 6.3.7 Before actual placing, the Contractor shall study the drawings thoroughly and inform the Owner/Engineer in case he feels that placement of certain bars is not possible due to congestion. In such cases he should not start placing any bar before obtaining clearance from the Owner/Engineer.

6.4 WELDED JOINTS OR MECHANICAL CONNECTIONS

- 6.4.1 Welded joints or mechanical connections in reinforcement may be used but in all cases of important connections, tests shall be made to prove that the joints are of full strength of bars connected.

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6.4.2 Welding of reinforcement bars shall be done in accordance with the recommendations of IS: 2751 for welding cold worked steel bars for reinforced concrete construction.

6.4.3 Lap splices for bars large than 36mm may be welded after getting the approval from the Owner/Engineer.



6.4.4 Welded mesh fabric may also be used if specified.

6.5 BAR BENDING SCHEDULES (B.B.S)

6.5.1 For such works for which working drawings and bar bending schedule are not supplied by the Owner/Engineer, the Contractor shall submit to the Owner/Engineer for approval of Bar Bending Schedules with working drawings showing clearly the arrangements proposed by him to match available stock of reinforcement steel.

6.5.2 Upon receipt of the Owner/Engineer's final approval of the bar bending schedule and working drawings, the Contractor shall submit final drawings after incorporating necessary modifications or corrections, for final record and distribution.



6.5.3 Approval of such detailed drawings by the Owner/Engineer shall not relieve the Contractor of his responsibility for correctness of the documents produced by him.

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7.0 FORM WORK

7.1 GENERAL

- 7.1.1 The formwork shall be designed and constructed to the shapes, grades, lines, levels and dimensions of members as shown on the drawings within acceptable tolerances.
- 7.1.2 Materials used for the formwork inclusive of the supports and centering shall be capable of withstanding the working loads (i.e., the loads from green concrete, vibrations, movements of men and materials and plants and other incidental loads) and remain undistorted throughout the period it is left in service without excessive deflections beyond permissible limits.
- 7.1.3 All supports and scaffold should be manufactured from structural or tubular steel except when specifically permitted otherwise by the Owner/Engineer.
- 7.1.4 The centering shall be true to vertical, rigid and thoroughly braced both horizontally and diagonally. Rakers are to be used where forms are to support inclined members.
- 7.1.5 The formwork shall be so constructed as to be easily removable in sections by unscrewing or otherwise loosening them without hammering or leaving with force. Only wedges, clamps, bolts or screws, etc., shall be used in preference to nails or spikes. All side pieces shall be easily removable without disturbing the bottom pieces. Where however, use of nails and spikes become unavoidable, these shall be left projecting so that they can easily be withdrawn.
- 7.1.6 If at any stage of work, during or after placing concrete in the structure, the formwork sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid formwork. Details of shuttering and centering shall be subject to the approval of the Owner/Engineer.
- 7.1.7 To achieve the desired rigidity, tie bolts, spacer blocks, tie wires and clamps as approved by the Owner/Engineer shall be used but they must in no way impair the strength of concrete or cause stains or marks on the finished surface.

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7.1.8 Bolts passing, completely through liquid retaining walls/slabs, for the purpose of securing and aligning the formwork, shall not be used.

7.1.9 The formwork shall be such as to ensure a smooth uniform surface free from honeycombs, air bubbles, fins and other blemishes. Any blemish or defect found on the surface of the concrete must be brought to the notice of the Owner/Engineer immediately and rectified free of charge.

7.1.10 All floor and beam centering shall be crowned not less than 10mm in all directions for every 5 meters span or as directed by the Owner/Engineer. For cantilevers, the camber at free end shall be 1/50th of the projected length or as directed by the Owner/Engineer.

7.1.11 Temporary openings for cleaning, inspection and for pouring concrete shall be provided at places, where they are necessary and as may be directed by the Owner/Engineer. The temporary openings shall be so formed that they can be conveniently closed when required, during pouring operations without leaving any mark on the concrete.

7.2 CLASSIFICATION OF FORMWORK



7.2.1 Formwork shall be classified as given below depending upon the type of finish required for a particular work.

a) Ordinary

These shall be used in places where ordinary surface finish is required and shall be composed of steel plates only.

b) Plywood

These shall be used in exposed surfaces, where an especially good finish is required and shall be made of approved brand of heavy quality plywood to produce a perfectly uniform and smooth surface conforming to the shape described in the drawing with required grain texture on the concrete.

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Re-use may be permitted only after special inspection and approval by the Owner/Engineer. The Owner/Engineer may also permit utilization of used plywood for the 'ordinary' class, if it is still in good condition.

c) Ornamental

These shall be used where ornamental and curved surface are required for architectural surfaces and shall be made of selected best quality well seasoned timbers or of plywood, approved by the Owner/Engineer. This formwork is required to give a surface with a clear impression of lines according to the pattern specified by the Architect in drawings, without requiring any treatment.



7.2.2 Generally, the "Ordinary" class of formwork shall be used unless otherwise directed by the Owner/Engineer.

7.2.3 Selection of a particular type of formwork shall also take into account the following:

- a) Concrete surface requiring being finished separately with plastering or rendering.
- b) Concrete surface free from joint marks, honeycombing, etc., and is presentable without further treatment.



7.2.4 Shuttering shall be either of wooden plank of 30mm minimum thickness with or without steel sheet lining or of plates stiffened suitably by steel angles and should be such as to give the required type of surface finish. The timber used for shuttering shall not be so dry as to absorb water from the concrete and swell and bulge, nor so green or as to shrink after erection.

7.2.5 The timber shall be accurately sawn and planed on the sides and surface coming in contact with concrete. Thus the shuttering will have smooth and even surface and the joints shall not permit any leakage of cement slurry or grout.

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7.3 DESIGN OF FORMWORK

- 7.3.1 If it is so desired by the Owner/Engineer, the Contractor shall prepare, before commencement of actual work, designs and working drawings for formwork, staging and centering and get them approved by the Owner/Engineer.
- 7.3.2 For formwork of proprietary nature (e.g. Slipform, Dokaform, etc.,) the Contractor shall furnish all relevant details to the Owner/Engineer for his review/approval. Notwithstanding Owner/Engineer's approval, the Contractor is solely responsible for satisfactory usage and performance guarantee of such forms in the works.
- 7.3.3 The formwork shall be so designed and erected that the forms for slabs and the sides of beams, columns and walls are independent of the soffit of beams and can be removed without any strain to the concrete already placed or affecting the remaining formwork.
- 7.3.4 The forms shall be sufficiently strong to carry without undue deformation, the dead weight of the concrete as a liquid as well as the working loads from men and materials, plants and other incidental loads.
- 7.3.5 The formwork shall be strong enough to withstand the effects of vibration without appreciable deflection, bulging, distortion or loosening of its components.
- 7.3.6 The joints in the formwork shall be sufficiently tight to prevent any leakage of slurry or mortar.
- 7.3.7 If formwork for column is erected for the full height of the column, one side shall be left open and built up in sections progressively as placing of concrete is continued.
- 7.3.8 Wedges, spacer bolts, clamps or other suitable means shall be provided to allow accurate adjustments and alignment of the formwork and to allow it to be removed gradually without jarring the concrete.

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7.3.9 In case of structures with two or more floors, the weight of concrete and centering and shuttering of any upper floor shall be suitably supported on at least two floors below the same. In such cases the props of upper floors must necessarily come over the props of the lower floors. The formwork and concreting of the upper floors shall not be done until the concrete of the lower floor has set for at least 14 days.

7.4 INSPECTION OF FORMS

7.4.1 Casting of Concrete shall start only after the formwork has been inspected and approved by the Owner/Engineer.

7.4.2 The concreting shall start as soon as possible within 3 (three) days after the approval of the formwork and during this period the formwork shall be kept under constant vigilance against any interference.

7.4.3 In case of delay beyond three days, a fresh approval from the Owner/Engineer shall be obtained.



7.5 SURFACE TREATMENT FOR SHUTTERING

7.5.1 Forms shall be cleaned of all dust, wood shavings, dirt and other matter by washing with water.

7.5.2 The surface shall then be coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint.

7.5.3 Alternatively, a coat of raw linseed oil / refined pale paraffin mineral oil or form oil of approved manufacture may be applied.

7.5.4 In case steel shuttering is used, soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface.

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7.5.5 The oil or coating shall be applied with a brush or sprayed so as to cover the entire surface evenly. Care shall be taken that the coating does not get on construction joint surfaces and reinforcement bars. It shall also not cause softening or permanent staining of concrete surface not shall impede the wetting of surfaces to be water cured.

7.5.6 Special care shall be taken in case of small grooves. The form strips shall be oiled or coated thoroughly so as to prevent swelling of the forms and consequent damage to the concrete on removal of forms.

7.6 TOLERANCE

7.6.1 The formwork shall be designed and constructed as per section 3.3.1 of ACI 347-78, Recommended Practice for concrete formwork.

TOLERANCES SUGGESTED BY ACI FOR REINFORCED CONCRETE BUILDINGS

Variations from the plumb.

In the lines and surfaces of columns, piers, walls and in arrises

In any 10 feet of length 1/4 inch

Maximum for entire length. 1 inch

For exposed corner columns, control-joint grooves and other conspicuous lines

In any 20 feet of length 1/4 inch

Maximum for entire length. 1/2 inch

Variation from the level or from the grades indicated on the drawings.

In slab soffits, ceilings, beam soffits and in arrises



In any 10 feet of length 1/4 inch

In any bay or in any 20 feet of length 3/8 inch

Maximum for entire length 3/4 inch

In exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines

In any bay or in any 20 feet of length 1/4 inch

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Maximum for entire length. 1/2 inch

Variations of distance between walls, columns, partition sand beams.

1/4 inch per 10 feet(1) of distance but not more than 1/2 inch(9) in any one bay and not more than 1 inch(7)total variation

Variation of linear building lines from established position in plan1 inch(13)

Variation in the sizes and locations of sleeves, floor openings and wall openings.

Minus 1/4 inch

Plus 1/2 inch

Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.

Minus 1/4 inch

Plus 1/2 inch(15)

Footings.

Variation in dimensions in plan

Minus 1/2 inch(16)

Plus 2 inches(17)

when formed or plus 3 inches when placed against un-formed excavation

Misplacement or eccentricity

2 percent of the footing width in the direction of misplacement but not more than 2 inches



Reductions in thickness

Minus 5 percent of specified thickness

Variations in steps.

In a flight of stairs

Rise 1/8 inch

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Tread 1/4 inch

In consecutive steps

Rise 1/16 inch

Tread. 1/8 inch

7.6.2 The tolerances are for local aberrations in the finished concrete surface and apply to concrete dimensions only and not to the positioning of vertical reinforcing steel or dowels.

7.6.3 Setting and alignment of formwork should be as accurate as possible and to the satisfaction of the Owner/Engineer.

7.6.4 Any error, within the above tolerance limits or any other as may be specially set up by the Owner/Engineer, if noticed in any lift of the structure after stripping of forms, shall be corrected in the subsequent work to bring back the surface of the structure to its true alignment.

7.7 STRIPPING OF FORMS



7.7.1 Before removing any formwork, the Contractor must notify the Owner/Engineer well in advance to enable him to inspect the concrete if he so desires.

7.7.2 Forms for various types of structural components shall not be removed before the minimum periods specified in TABLE 4 of this specification and the removal after the minimum periods shall also be subject to the approval of the Owner/Engineer.

7.7.3 In case of beams with construction joint, the entire span of the beam shall be kept supported by formwork till its removal for the last opinion of the beam, cast at a later date.

7.7.4 In slab and T-beam construction, sides shall be stripped first, then the underside of slab and lastly that of beam.

7.7.5 In case of cantilever slabs and beams, centering shall remain till structures and counter acting or holding down members have been erected and have attained adequate strength.

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7.7.6 Where the shape of the element is such that the formwork has re-entrant angles, the formwork shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

7.7.7 The Contractor shall record on the drawing or in any other approved manner, the date on which concrete is placed in each part of the work and the date on which the formwork is removed there from and have this record checked and countersigned by the Owner/Engineer regularly.

7.7.8 The Contractor shall be responsible for the safe removal of the formwork and any work showing signs of damage through premature removal of formwork or loading shall be rejected and entirely reconstructed by him without any extra cost to the Owner.



7.8 RE-USE OF FORMS

7.8.1 Before re-use, all forms shall be inspected by the Owner/Engineer and their suitability ascertained. Formwork shall not be used/re-used if declared unfit or unserviceable by the Owner/Engineer.

TABLE 4

SUGGESTED SCHEDULE FOR STRIPPING OF FORMS



Sr. No.	Part of Structure	Ordinary Portland Cement Concrete		
		Temperature		
		38 °C to 20 °C	20 °C to 5 °C	Below 5 °C
		Days	Days	Days
1	Columns and walls	1 to 2	3 to 4	Do not remove forms until site cured test specimen develop at least 50% of the specified 28 days strength
2	Beam vertical sides	1 to 2	3 to 4	
3	Removal of props to Slabs, (spanning upto 4.5m)	7	14	

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4	Removal of props to Slabs, (spanning over 4.5m)	14	24
5	Beams soffits (props left under)	7	8
6	Slabs (props left under)	4	8
7	Removal of props to Beams and arches (spanning upto 6m)	14	21
8	Removal of props to Beams and arches (spanning over 6m)	21	24



Note:

1. Wherever exposed surfaces of concrete can be effectively sealed to prevent loss of water, the periods specified for temperature above 40 °C can be reduced to those of the temperature range of 40 °C to 20 °C subject to approval of the Owner/Engineer.
 2. For Rapid hardening cement, 3/7 of the above period will be sufficient in all cases except verticals sides of slabs, beams and columns which should be retained for 24 hours.
 3. All formworks should be removed without shock or vibration as these would damage the reinforced concrete before the soffit and struts are removed, the concrete surface should be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all elements in the cold weather.
- 7.8.2 Before re-use, all forms shall be thoroughly scrapped, cleaned, joints and planes examined and when necessary repaired, and inside surface treated as specified in this specification.

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8.0 OPENINGS, CHASES, GROOVES, REBATES, BLOCKOUTS, ETC.

8.1 The Contractor shall leave all openings, grooves, chases, rebates; block outs, etc., in concrete work as shown on drawings.

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9.0 EMBEDDED FIXTURES

- 9.1 The Contractor shall build into concrete work all the items noted below, either supplied by Owner/Engineer or supplied by him, and shall embed them partly or fully as directed or as shown in drawings and secure the same as may be required.
- a) Inserts, hangers, anchors, frames around openings, manhole covers, frames, floor clips, sleeves, conduits and pipes.
 - b) Anchor bolts and plates for machinery, equipment and for structural steel work.
 - c) Steel structural to be left embedded for future extension, special connection etc.
 - d) Dowel bars, etc., for concrete work falling under the scope of other contractors.
 - e) Lugs or plugs for door and window frames occurring in concrete work.
 - f) Flashing and jointing in concrete work.
 - g) Any other embedment and fixture as may be required, and specified.
- 9.2 The materials, if required to be supplied by the Contractor, shall be as specified and be of best quality available according to relevant Standards and of approved manufacturer and to the satisfaction of the Owner/Engineer.
- 9.3 Exposed surfaces of embedded materials, unless noted otherwise, shall be painted with one coat of approved anti-corrosive paint and / or bituminous paint without any extra cost to the Owner.
- 9.4 If welding is to be done subsequently on the exposed surface of embedded material, the paint shall be cleaned off the member to a minimum length of 50mm beyond each side of the weld line.
- 9.5 Necessary templates, jigs, fixtures, supports etc., shall be used as may be required or directed by the Owner/Engineer, at no extra cost to the Owner/Engineer.
- 9.6 Correct location and alignment, as per drawings / instructions of all these embedded items, shall be solely the responsibility of the Contractor.

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10.0 GROUTING UNDER MACHINERY OR STRUCTURAL STEEL BASES

- 10.1 If specified, grouting under base plates of machines or structural steel column bases, etc., shall be carried out by the Contractor. Grout material should be from SIKA or as approved by Owner/Engineer.
- 10.2 Unless specified otherwise in drawing, the grout shall be of 1:2 cement-sand mix (by volume) and just enough water to make it flow as required. Where directed, 6mm down stone chips may have to be used in the mix.
- 10.3 The areas to be grouted shall be cleaned thoroughly with compressed air jet and / or with water in locations where accumulated surplus water is to be removed. Surface to be grouted shall be kept moist for at least 24 hours in advance. The grout shall be placed under expert supervision, so that there is no locked up air and edges finished properly.
- 10.4 If directed by the Owner/Engineer, admixtures like 'Aluminum powder', 'Ironite', etc., may have to be added with the grout in proportions specified to achieve non shrink grouts. Admixture, to be added, will not be measured and paid separately.
- 10.5 The grouting material shall solidly fill the spaces to be grouted and permanently retain its original volume so that the base plate will be held firmly in the set position. The amount of water used in mixing shall be kept to a minimum such that the grout shall have a consistency too stiff to flow.
- 10.6 Neat cement slurry shall not be used for grouting under any condition.
- 10.7 After the initial set is over, the grout shall be kept thoroughly wetted for a minimum period of 7 days.
- 10.8 Care is to be taken during grouting so that the base plate level and alignment is not disturbed.
- 10.9 The Contractor shall obtain prior approval of the Owner/Engineer regarding the type and manufacturer of all pre-mix, free-flow, non-shrink grouts before procurement.



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10.10 Minimum thickness of grout shall be 25mm unless noted otherwise in drawings.

10.11 Minimum cement content (exclusive of permissible wastage) to be used for the grout shall be as follows unless otherwise noted in drawings / schedule of quantities:



- a) 1:2 Nominal cement-sand grout mix: 718kg/cu.m of finished grout mortar.
- b) Cement concrete grout with 10mm and down graded aggregate :

<u>Concrete Grade</u>	<u>Minimum cement content</u>
M-15	359 kg/cu.m of finished concrete
M-20	422 kg/cu.m of finished concrete
M-25	496 kg/cu.m of finished concrete
M-30	591 kg/cu.m of finished concrete

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11.0 RUBBER PADS FOR VIBRATION ISOLATION

- 11.1 Hard foundation quality rubber pads of specified grade, thickness and shapes shall be put below machine or other foundations as shown on the drawings.
- 11.2 The rubber shall have a unit weight of 1500kg/cu.m, a shore hardness of 65A to 70A and be of best quality of approved manufacture, durable, capable of absorbing vibration and must be chemically inert when in contact with moist or dry earth or any other deleterious material expected under normal conditions.

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12.0 WATER PROOFING OF CONCRETE

12.1 GENERAL

12.1.1 Water proofing of concrete can be done by any one or combination of the following methods and shall be as specified in drawings or as directed by the Owner/Engineer:

- a) by use of suitable design mix for the concrete
- b) by adding suitable admixtures in the concrete or mortar at the time of mixing
- c) by treating with water proof bituminous paint
- d) by fixing bitumen felts
- e) by installing water bars (metallic, rubber or P.V.C) at the joints.

12.1.2 The method of application of water proofing treatment (b to e above) shall conform to the manufacturer's specification. The Contractor shall have the manufacturer's assistance, if required by the Owner/Engineer, in the application of treatment at no extra cost to the Owner.



12.1.3 If desired by the Owner/Engineer, test certificates for the materials and samples shall be produced by the Contractor at no extra cost to the Owner/Engineer.

12.1.4 The material and workmanship shall conform to applicable American / British / IS Codes.

12.2 ADMIXTURE IN CEMENT/PLASTER

12.2.1 Water proofing admixture shall be of the quality and type approved by the Owner/Engineer. The quantity of admixture to be used along with cement shall be as specified by the manufacturer but in no case shall exceed 3% by weight of cement.

12.2.2 The surface to be treated with plaster mixed with admixture shall be cleaned and kept wet for 24 hours.

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12.2.3 The plaster shall be in cement-sand mortar (generally 1:1 to 1:4 proportions by volume; or proportion as indicated in drawing) along with the approved admixture and lay in layers not exceeding 15mm / layer or as per manufacturer's specification.

12.2.4 On completion, the plastered surface shall be cured continuously for the period specified for concrete surfaces.

12.3 BITUMINOUS PAINT

12.3.1 The concrete surface to be waterproofed shall be rendered absolutely dry, clean and dust free by rubbing with sand paper before the application of coating.



12.3.2 Then the surface shall receive any of the following coatings as specified:

- a) Hot Coal Tar Pitch conforming to code BS-76 / IS: 216 not less than 2 kg/sq.m; Coal Tar shall not be heated more than 190 °C.
- b) Apply hot Asphalt (i.e., bitumen conforming to BS-2000) not less than 1.5 kg/sq.m; Asphalt shall not be heated more than 190 °C.

12.3.3 When the first coat as in clause 12.3.2 above has completely dried up and approved by the Owner/Engineer, the second coat shall be applied in the same manner using not less than 1.25 kg/sq.m in case of Coal Tar and 1 kg/sq.m in case of Asphalt.

12.3.4 Immediately after the application of second coat and before it is dried up, sand shall be spread on the surface to cover it completely. After spreading of sand, sufficient time shall be allowed for the final coat to dry up completely before backfilling is done.

12.3.5 For preparation of bituminous paint, the bitumen of 10/20 grade should be broken into pieces and uniformly heated to 60 to 80° C, stirring, dehydrating, and cleaning until no spume generating then add 20-40% kerosene as a solvent (by weight) to make the paint workable. The mix ration should be approved and signed by Owner/ Engineer.

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12.4 BITUMINOUS FELT

12.4.1 The materials shall conform to BS-1447 and laying shall be in accordance with BS-1447.



12.4.2 The bitumen felt shall be hessian base and / or fibre base and shall be as specified in drawings.

12.4.3 The Contractor shall execute this work with assistance from specialist supplier / agency approved by the Owner/Engineer at no extra cost to the Owner/Engineer.

12.4.4 Cleaning the surface, keeping it dry, providing necessary corner fillets and cement rendering and cutting chases, etc., shall be included in the rate for this item.



12.4.5 Protective brickwork on / against concrete sub-bases or walls, if required, will be paid extra under suitable item.

12.4.6 A 01 (one) years' guarantee for satisfactory performance shall be produced by the Contractor. Free rectification of any defects noted in the work within this guarantee period shall be carried out by the Contractor even if it is beyond the specified maintenance period of the Contract.

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13.0 PRECAST CONCRETE

- 13.1 The specification for precast concrete will be similar as for the casting-place concrete described in this specification and as supplemented in this section.
- 13.2 All precast work shall be carried out in a yard made for the purpose. This yard shall be dry, properly leveled and having a hard and even surface. If the ground is to be used as a soffit former of the units, it shall be paved with concrete or masonry and provided with a layer of plaster (1:2 proportions) with smooth neat cement finish or a layer of M.S sheeting.
- 13.3 Where directed by the Owner/Engineer, casting will have to be done on suitable vibrating table.
- 13.4 The yard, lifting equipment, curing tank, finished material storage space etc., shall be designed such that the units are not lifted from the mould before 7(seven) days of curing and can be removed for erection after 28(twenty eight) days of curing.
- 13.5 The mould shall preferably be of steel or of timber lined with G.I sheet metal.
- 13.6 The yard shall preferably be fenced.
- 13.7 Lifting hooks, where necessary or as directed by the Owner/Engineer, shall be embedded in correct position of the units to facilitate erection, even if they are not shown on the drawings, and shall be burnt off and finished after erection.
- 13.8 Precast concrete units, when ready, shall be transported to site by suitable means approved by the Owner/Engineer. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, leveling and plumbing shall be done as per instructions of the Owner/Engineer.
- 13.9 The precast concrete units shall be marked clearly on top and shall be stored clear of ground until required for erection. The precast units shall be handled and erected by methods approved by the Owner/Engineer to protect from damage.

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13.10 After erection and alignment, the joints shall be filled with grout or concrete as directed by the Owner/Engineer.

13.11 If centering have to be used for supporting the precast units, they shall not be removed until the joints have attained sufficient strength and in no case before 14(fourteen) days. The joint between precast roof planks shall be pointed with 1:2 cement-sand mortar where specified in the drawings

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14.0 CONCRETING UNDER SPECIAL CONDITIONS

14.1 WORK IN EXTREME WEATHER CONDITIONS

14.1.1 During hot or cold weather, the concreting should be done in accordance with BS-5328 Part – 1 to 4.



14.1.2 In hot weather concreting, the Contractor shall stagger the work to the cooler parts of the day to ensure that the temperature of the wet concrete used in massive structures does not exceed 38 °C while placing. Positive temperature control by pre-cooling, post-cooling or any other method, if required, will be specified and paid separately.

14.2 UNDER WATER CONCRETE

14.2.1 When it is necessary to place concrete under water (including in sea-water), it shall be done in accordance with BS 5328.



14.3 CONCRETE IN AGGRESSIVE SOILS AND WATER

14.3.1 Guidelines regarding durability requirements of concrete exposed to sulphate attack shall be as per BS 5328.

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15.0 USE OF ADMIXTURES

- 15.1 All concrete shall be designed for normal rate of setting and hardening at normal temperature. Admixtures may be permitted to be used in accordance with BS-5328, to modify the rate of hardening, to improve workability or as an aid to control concrete quality.
- 15.2 The Owner/Engineer reserves the right to require laboratory test or use test data, or other satisfactory reference before granting approval.
- 15.3 The admixture shall be used strictly in accordance with the manufacturer's directions.



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16.0 QUALITY CONTROL

16.1 Contractor shall establish and maintain quality control for different items of work and materials as may be directed by the Owner/Engineer to assure compliance with contract requirements and maintain and submit to the Owner/Engineer records of the same.

16.2 The quality control operation shall include but not be limited to the following items of work:



- a) Aggregate : Physical, chemical and (coarse & fine) mineralogical qualities, washing, grading, moisture content and impurities.
- b) Water : Impurities tests.
- c) Cement : Tests to satisfy relevant specification
- d) Admixture : Type, quantity, physical and chemical properties that affect strength, workability and durability of concrete.
- e) Formwork : Material, shapes, dimensions, lines, elevations, surface finish, adequacy of form, ties, bracing and shoring and coating.
- f) Reinforcement : Shapes, dimensions, length of splices, clearances, ties and supports. Quality and requirement of welded splices.
Tests to satisfy relevant IS specification
- g) Grade of concrete : Usage and mix design, testing of all properties.
- h) Batching & mixing : Types and capacity of plants, concrete mixers and transportation equipment.
- i) Joints : Locations of joints, water stops and filler materials. Dimension of joints, quality and shape of joint material and splices.
- j) Embedded Items : Material, shape, location, setting. anchorage items
- k) Placing : Cleaning & preparation of surfaces, rate of pouring, weather limitations, time intervals between mixing and placing and between two successive lifts, covering over dry or wet surfaces, application of

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mortar/slurry for proper bond, prevention of cold joint, types of chutes or conveyors.

- l) Compaction : Number of vibrators, their prime mover, frequency and amplitude of vibration, diameter and weight of vibrators, duration of vibration , hand-spreading, roding and tamping.
- m) Setting of base plates: Lines, elevations and bedding mortar/grout
- n) Concrete finishes : Repairs of surfaces defects, screeding, floating, steel trowelling and brooming, special finishes.
- o) Curing : Methods and length of time.

16.3 Copies of records and tests for the items noted above, as well as, records of corrective action taken shall be submitted to the Owner/Engineer for approval as may be desired.

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17.0 SAMPLING AND TESTING

17.1 GENERAL

17.1.1 The Contractor shall carry out all sampling and testing in accordance with the relevant International Standards and as supplemented herein for the following items at his own cost unless otherwise specified in this specification.

17.1.2 The Contractor shall get the specimens tested in a laboratory approved by the Owner/Engineer and submit to the Owner/Engineer the test results in triplicate within 3 (three) days after completion of the test.

17.2 CEMENT



17.2.1 Representative samples shall be taken from each consignment of cement received from the manufacturer/supplier for carrying out the tests for fineness (by hand sieving), setting time and compressive strengths as per BS-1881 Part 131 Soundness tests shall be carried out if required by the Owner/Engineer. It is contractor's responsibility to carry out the entire tests on cement at their own cost.

17.2.2 No cement from a particular consignment/batch will be used on the works unless satisfactory 3 (three) days and 7 (seven) days test results for compressive strength are known.

17.2.3 These tests are of great importance as their results will have a bearing on the acceptance of concrete or otherwise as per the terms and conditions of the Contract.

17.3 AGGREGATES (COARSE AND FINE)

17.3.1 The Contractor shall carry out any or all the tests on aggregates as may be required by the Owner/Engineer. It is contractor's responsibility to carry out the entire tests on crush and sand samples at their own cost.

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17.3.2 The acceptance criteria of the samples tested shall be in accordance with the requirements of the relevant Standards.

17.3.3 Field Tests For Aggregates

i. Surface Moisture Content & Absorption

The surface moisture in the aggregate, influences the water cement ratio, strength and durability of the mix. To determine the surface moisture of moist or wet aggregate, method is as follows:

FRYING PAN METHOD



The following apparatus are required:

- A frying pan or metal tray,
- Gas stove or an electric hair dryer,
- A metal or glass stirring rod and
- Scales to measures.

The following procedure is followed during the test

- For coarse aggregate 2 kg sample is adequate and for fine aggregate 0.5 kg sample is adequate.
- The wet/moist sample is then weighed wet weight (W)
- Heated very gently on the frying pan or metal plate and stirred with a glass or metallic rod to maintain uniform distribution of heat, until the sheen disappears from the surface. The fine aggregates become surface dry when it just starts showing free flowing characteristics.
- The aggregates is then cooled and reweighed. The surface dry aggregate weight (Wsd) is noted. The surface moisture is then calculated as follows

$$\text{Surface moisture} = [(W - Wsd) / Wsd] \times 100\%$$

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- Overheating must be avoided, as it will not give the correct surface moisture.
- If heating is continued either on the fry pan or in the oven till the aggregate is bone dry aggregate weight is then noted (Wbd) after continuous heating. The absorption (absorbed water content) is then calculated as follows

$$\text{Absorption} = [(Wsd - Wbd) / Wbd] \times 100\%$$

Similarly, if the dry aggregates are received on site and absorption capacity is to be determined then the aggregates are first soaked in water and then the above methods are deployed to determine the absorption capacity of aggregates.

ii. Silt Content Test For Sand

Silt Content test of Aggregate



SAND	SILT	CLAY
0-10% CLAY	10-30% CLAY	50-100% CLAY
0-10% SILT	30-50% SILT	0-45% SILT
80-100% SAND	25-50% SAND	0-45% SAND

The permissible silt content in sand (fine aggregate) must not exceed the values as specified in the standards. However, this method can only be used for natural sand, it should not be used for crushed rock sand.

The apparatus required for this test is only 250 ml glass measuring cylinder.

The silt content determination by volume is done in the following manner:

- The glass cylinder is filled with salt-water solution (concentration of the solution will teaspoon full of common salt for every 570 ml) upto 50 ml mark.
- Add sand until the level of the sand is upto 100 ml mark.

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- Add further salt-water solution till 150 ml mark is reached.
- Place the palm on the mouth of the glass cylinder and shake it vigorously.
- Place the cylinder on hard levelled surface and tap it all round so that sand is leveled.
- Wait for three hours for silt to settle on top of sand.
- Measure the thickness of the silt layer and the height of the sand. The silt content can be calculated as follows:

$$\text{Silt (\% by volume)} = \left[\frac{\text{Thickness of silt layer}}{\text{Height of sand + Silt}} \times 100 \right] \%$$

If silt content by weight exceeds 3% then washing of sand is necessary. After conducting few tests, a co-relation can be developed for silt layer thicknesses at various intervals of time. The silt content at 10 minutes can be fixed as inspection criteria.



iii. Bulking Of Sand

When sand is damp, the water coating on the surface of each sand particle causes separation of particles from one another due to surface tension. This causes sand to bulk. Bulked sand occupies more volume and hence if volumetric measuring is done while proportioning it, bulking correction is necessary.

The bulking test is done as follows:

1. The sand is filled, in loose condition in a box of measured height (H cm).
2. The box is then flooded with water and rodding is done to make the sand settle and consolidate. Care should be taken that sand does not overflow during the flooding and compaction.
3. The sand is then leveled in the box and the drop in height is measured (h cm).
4. Bulking is calculated as: $\text{Bulking \%} = \frac{h}{H} \times 100\%$

Dry sand occupies the same volume as fully saturated sand. The bulking will vary from load to load and day to day depending on the fineness of sand and its surface moisture content. It is

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therefore, very essential to make bulking corrections by checking the actual bulking of sand proposed to be used by volumetric batching for mortar or concrete.

Moisture contents %age by wt.	Bulking % by volume
2	15
3	20
4	25
5	30



iii. Sieve Analysis

Sieve analysis is done to check the gradation of aggregate. The test is done as follow.

1. Take required amount of aggregate sample (for coarse aggregate take apprx. 2.5 kg and for fine aggregate take 0.5 kg)
2. Arrange the required no of sieves as per the contract or job requirement in a descending manner. (i.e. keep the sieve having largest size opening at the top and the smallest size opening at the bottom)
3. Shake vigorously the sieve set for at least 2 minute.
4. Then measure the weight of aggregate on each sieve and express it as the percentage of passing.

Now compare these values with the recommended values to know whether it falls within the range or not. If not falling within the desired gradation then take necessary action.

Grading limit of coarse aggregate and fine aggregate is given below for reference.

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I.S. Sieve Designation	%age passing for graded aggregate of nominal size			
	40 mm	20 mm	16 mm	12.5 mm
80 mm	100	-	-	-
63 mm	-	-	-	-
40 mm	95 to 100	100	-	-
20 mm	30 to 70	95 to 100	100	100
16 mm	-	-	90 to 100	-
12.5 mm	-	-	-	90 to 100
10 mm	10 to 35	25 to 55	30 to 70	40 to 85
4.75 mm	0 to 5	0 to 10	0 to 10	0 to 10
2.36 mm	-	-	-	-

Grading Limit of Coarse Aggregate



IS Sieve	Equivalent BS sieve	Percentage passing for			
		Zone 1	Zone 2	Zone 3	Zone 4
10 mm	3/8 -in	100	100	100	100
4.75 mm	3/16 - in	90-100	90-100	90-100	95-100
2.36 mm	No.7	60-95	75-100	85-100	95-100
1.18 mm	No.14	30-70	55-90	75-100	90-100
600 micron	No.25	15-34	35-59	60-79	80-100
300 micron	No.52	5-20	8-30	12-40	15-50
150 micron	No.100	0-10	0-10	0-10	0-15

Grading Limit of Fine Aggregate

This test is done initially for concrete mix design and later conducted periodically for mix proportion adjustments if it is suspected that the grading of aggregates has changed considerably.

iv. Fineness Modulus

Fineness modulus is generally used to get an idea of how coarse or fine the aggregate is. More fineness modulus value indicates that the aggregate is coarser and small value of fineness modulus indicates that the aggregate is finer.

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- Sieve the aggregate using the appropriate sieves (80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron & 150 micron)
- Record the weight of aggregate retained on each sieve.
- Calculate the cumulative weight of aggregate retained on each sieve.
- Calculate the cumulative percentage of aggregate retained.
- Add the cumulative weight of aggregate retained and divide the sum by 100. This value is termed as fineness modulus

Compare the test value with the values given in the following table and you can get an idea about how coarse or fine the sand is.



Only sand between FM 2.6 to 2.9 is considered suitable for nominal mix proportion.

Type of Sand	Fineness Modulus Value
Very fine sand	Below 2.2
Fine sand	2.2 to 2.6
Medium sand	2.6 to 2.9
Coarse sand	2.9 to 3.2
Very coarse sand	Above 3.2

17.4 WATER

17.4.1 Sampling and testing of water being used for concrete works shall be carried out by the Contractor at regular intervals and whenever directed by the Owner/Engineer.

17.4.2 The final acceptance criteria will be subject to the samples meeting the requirements

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17.5 ADMIXTURE

17.5.1 Air Entraining Agents (AEA)

Initially, before starting to use A.E.A., relationship between the percentage of air entrained and the cylinder, cube crushing strength vis-à-vis quantity of A.E.A. used for all types of concrete shall be established by the Contractor by carrying out sufficiently large number of tests. After that, at regular intervals and whenever directed by the Owner/Engineer, the Contractor shall check up the actual percentages of air entrained and corresponding crushing strengths to correlate with the earlier test results.



17.5.2 Other Admixtures

Tests for establishing the various properties of any other admixtures which may be required to be added shall be carried out by the Contractor.

17.6 CONCRETE



17.6.1 Sampling of concrete, making test specimens (15cm cubes), curing and testing procedure, etc. Normally, only compression tests shall be performed but under special circumstance, the Owner/Engineer may require other tests to be performed in accordance with BS-1881.

17.6.2 To control the consistency of concrete from every mixing plants, slump tests and/or Compacting Factor tests in accordance with BS-1881 Part 102 / shall be carried out by the Contractor every two hours or as directed by the Owner/Engineer. Slumps corresponding to the test specimens shall be recorded for reference.

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18.0 ACCEPTANCE CRITERIA FOR CONCRETE

- 18.1 Acceptance criteria for concrete shall be in accordance with the test results
- 18.2 Concrete work not meeting the acceptance criteria and/or rejected by the Owner/Engineer shall be dismantled and replaced by the Contractor as per specification and at no extra cost to the Owner.
- 18.3 For the concrete work not meeting acceptance criteria but in the opinion of the Owner/Engineer could be strengthened by suitable and accepted means; the complete cost of strengthening shall be borne by the Contractor.

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19.0 INSPECTION AND TESTING OF CONCRETE STRUCTURES

19.1 INSPECTION

19.1.1 Immediately after stripping the formwork, all concrete shall be carefully inspected and any defective work either removed or made good by the contractor as per the instructions of the Owner/Engineer and at no extra cost to the Owner, before concrete has thoroughly hardened.

19.1.2 In case of doubt regarding the grade of concrete used, either due to poor workmanship or based on results of cube strength tests, Core Test and/or Load Test shall be carried out in accordance with BS-EN 206. Other Non-Destructive tests may be adopted, in which case the acceptance criteria for test results shall be agreed upon between the Owner/Engineer and the Contractor and the tests shall be done under expert guidance.

19.1.3 The entire cost of Core Test, Load Test and Non-Destructive Test shall be borne by the Contractor.

19.2 CORE TEST

19.2.1 The locations from which cores are to be taken and the number of cores required shall be at the discretion of the Owner/Engineer and shall be representative of the whole of the concrete under review. In no case, however, shall fewer than three cores be tested.



19.2.2 Cores shall be prepared and tested

19.2.3 Concrete in the member represented by a Core Test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85% of the cube strength of concrete specified for the corresponding age and no individual core has strength less than 75%.

19.2.4 In case test results do not satisfy the requirements wide clause 19.2.3 above, Load Test may be resorted to.

19.3 LOAD TEST

19.3.1 The Owner/Engineer may instruct for a Load Test to be carried out on any structure/part of structure if in his opinion such a test is deemed necessary for any of the following reasons :

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- a) Site-made concrete test-cubes failing to attain the specified cube strength
- b) Suspected overloading during construction of the structure under review
- c) The concrete being improperly cured
- d) Shuttering being prematurely removed and not as per the specification
- e) The Core Test results not satisfying the requirements of clause 19.2.3 above or where such Core Tests or Non-Destructive tests have not been conducted.
- f) There being a reasonable doubt by the Owner/Engineer as to the adequacy of strength and stability of the structure/part of the structure.

19.3.2 Loading and acceptable deflection criteria for the Load Test shall be as per BS 5328.

19.3.3 Load tests shall not be made until the structure is at least 56 days old.



19.3.4 If the member shows evident failure during load test, such changes as are necessary to make the structure adequately strong shall be made by the Contractor free of cost to the Owner/Engineer. Alternatively, if permitted under 'Statutory Regulations' and at the discretion of the Owner/Engineer, the structure under test or a portion thereof may be retained as such without any modification by derating its load bearing capacity, provided the design criteria allows such derating.

19.4 CONCRETE PRETESTING PROCEDURE



19.4.1 To access the quality of cement at site, contractor shall do some field observation test e.g. The cement should be feel smooth when rubbed in two fingers, when hand thrust in the cement bag it should feel cool and the color of supplied cement should be gray, there should be not dust or lumps in cement, if throw a small quantity of cement in a bucket of water, the cement should float for a few minutes before it sinks, the immediate sinking of cement indicate the presence of impurity.

19.4.2 Contractor shall avoid cement bags that are older than six weeks from the date of manufacturing and shall be of approved make.

19.4.3 Contractor shall make sure that the cement bags are not hand stitched. They have to be sealed with machine stitching.

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- 19.4.4 Contractor shall check that fine aggregate (sand) and coarse aggregate (stone) must be clean. Inert, non porous and free from excessive quantities of dust, laminated particles and splinters.
- 19.4.5 Contractor shall use well graded, irregular shaped and ruff textured coarse aggregates, clean and sharp and free from clay, earth, vegetable and organic matters, alkaline or acid reactions or other deleterious salts or harmful matters and impurities.
- 19.4.6 Contractor is responsible of water quality used in the work, it shall be potable water and shall be free from all impurities whether suspended or dissolved and the PH of water should be 7 as the strength and workability of concrete depend to a great extent to amount of water used in mixing, the amount of water for certain proportion of given materials that produces a greater strength, practical value of water cement ratio for structural reinforced are about 0.45 for 1:1:2 concrete, 0.50 for 1:11/2:3 concrete and 0.55 to 0.60 for 1:2:4 concrete. Further, the water shall not contain any chemical impurities, salts, etc. of any kind.
- 19.4.7 Contractor shall achieve required compressive strength by using 6" dia. x 12" long test cylinder. Contractor shall responsible that concrete will proportion by weight for design of concrete mixes, unless specifically agreed by the Owner/Engineer to proportion them by volume.
- 19.4.8 The contractor shall submit to the Owner/Engineer proposed mix design for concrete to be used. Based on preliminary laboratory tests to determine proportion of cement, aggregates and water in the concrete conforming to the quality and strength requirements specified herein. Preliminary test result of at least three different mixes of each class of concrete with varied water cement ratio shall be submitted. The results of 7-days and 28-days cylinder tests shall be used to establish the ratio between 7 days and 28 days strengths of used concrete. The proportion of voids in between the coarse aggregate shall be controlled and if it exceeds 0.45% the contractor without any charge shall increase sand and consequently the cement. If the proportion is less than 0.45% sand shall be decreased but not the cement.
- 19.4.9 It is contractor's responsibility that concrete specimens shall be made, cured and tested in accordance with ASTM standard. No substitutions shall be made in the materials used in the work without additional tests in accordance herewith to indicate that the quality of the concrete is satisfactory.
- 19.4.10 Contractor is responsible for sampling, making, curing and testing of works test cylinders shall be carried out in accordance with ASTM C3 and C39. Test results shall be recorded on

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approved forms and submitted in duplicate to the Owner/Engineer immediately following the test.

19.4.11 From each sample contractor shall make six cylinders, three for test at seven days and the other three for test at twenty-eight days.

19.4.12 Specimens shall be cured under laboratory conditions except that the Owner/Engineer may require curing under field conditions in which case strength of field cured specimens shall not be less than 85% of that of companion laboratory condition cured specimens.

19.4.13 All cylinder moulds shall be steel moulds perfectly true, having all internal and meeting faces machined to a smooth surface.

19.4.14 If the strength tests of the laboratory cured specimens for any portion of the work falls below the minimum allowable compressive strength at 28-days required for the class of concrete used in that portion, the Owner/Engineer shall have the right to order replacement of the affected work.

19.4.15 It is contractor's responsibility to carryout entire tests at their own cost.

19.4.16 If a portion of the structure is found to be unacceptable, it shall be dismantled and replaced by a new structure as per specification. The entire cost of dismantling and replacement and restoration of the site shall be borne by the Contractor.

19.4.17 If in the course of dismantling, any damage is done to the embedded items and/or other adjacent structure, the same will be made good, free of charge by the Contractor to the satisfaction of the Owner/Engineer.

19.4.18 Contractor shall establish Site laboratory on site for testing concrete cubes, bricks, cement, motor test and road test etc. to save time.

19.4.19 Contractor shall comply with the QA/QC, Safety, Planning and Scheduling requirements of the Contract throughout the execution of the Project.

APPENDIX-A13



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

STANDARD SPECIFICATION FOR SITE CLEARING,
AREA GRADING, EXCAVATION AND EARTHWORK

DOC. NO: 0504196-CIV-SP-007

ENGINEERING CONSULTANT:



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Disclaimer

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	<u> </u> HAMZA	<u> </u> HAMMAD	<u> </u> Adeel	Jan 19 th , 2021		

January, 2021




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1.0 GENERAL

1.1 Scope

This specification covers site clearing, grubbing, excavating, area filling, back filling in and around structure and in plinths, blasting, if required, hauling, dumping and spreading of soil, undercutting to remove unstable soil areas, compacting existing soil surfaces and bottom of excavated areas to receive fills, compacting excavated areas for subgrade, pumping to keep excavated areas dry, final grading of designated areas, disposing of unsuitable and excess excavated materials and incidentals thereof for areas designated on the drawings.

1.2 Definitions

Owner : Oil & Gas Development Company Limited (OGDCL)

Engineer/Consultant : Petrochemical Engineering Consultants

Contractor : The Company named as such in the deed.

Shall/ Must/ Is To Be : A mandatory requirement

Should : A non-mandatory requirement, advisory or Recommendation



1.3 Errors or Omissions

1.3.1 The review and comment by the Owner/Engineer of any contractor's or its manufacturer's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

1.3.2 Any errors or omissions noted by the Contractor in this Specification shall be immediately brought to the attention of the Owner/Engineer.

1.4 Deviations



All deviations to this Specification, other specifications or attachments shall be brought to the knowledge of the owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the owner prior to

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execution of the work. Such deviations shall be shown in the documentation prepared by the contractor.



1.5 Conflicting Requirements

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Owner/Engineer whose decision shall prevail.

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2.0 SITE CONDITIONS



- 2.1 The characteristics of soils and the results of field and laboratory tests will be indicated in the soil report.
- 2.2 The Contractor shall familiarize himself with the soil report to ensure that the equipment / tools / terminals to be used are suitable to carry out the specified work.
- 2.3 Boring and sub-surface data regarding the nature of soil, rock, sub-soil water etc. shown on drawings or otherwise furnished to the Contractor shall be taken as for guidance only.
- 2.4 The Contractor must satisfy himself regarding the character and volume of all works under this contract and expected surface, sub-surface and / or sub-soil water to be encountered.
- 2.5 The Contractor must also satisfy himself about the general conditions of site and ascertain the existing and future construction likely to come up during the execution of the Contract so that he may evolve a realistic programme of execution.
- 2.6 Prior to commencement of work, the method of working, programme, and type of terminal to be used shall be submitted to the Owner/Engineer for approval.

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3.0 CODES AND STANDARDS



All work under this specification, unless specified otherwise, shall conform to the latest editions and supplements of following Standard Specifications and Codes of Practice. In case any particular aspect of work is not covered specifically by Standard Specification, any other standard practice as may be specified by the Owner/Engineer shall be followed. Some of the international specifications and codes are as under:

ASTM D420	Investigation and sampling soil and rock for Engineering purposes.
ASTM D698	Moisture-Density relations of soil (Proctor density test using 5.5 kg rammer)
ASTM D854	Specific gravity of soils
ASTM D1556	Density of soils place by sand code method
ASTM D1557	Moisture density relations of soils (Proctor density test using 4.54kgs rammer)
ASTM D2487	Classifications for soil for Engineering purposes
ASTM D2937	Test methods for density of soil in place by dry cylinder method
BS 5930	Code of practice for site investigations.
BS 6031	Code of practice for earthworks.

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4.0 MATERIALS TO BE USED

- 4.1 All materials required for the work shall be of best commercial variety and as approved by the Owner.
- 4.2 Material required for area filling shall be same material obtained from cutting, shall consist of granular material free from roots, vegetation, decayed organic matter, harmful and deleterious salts and chemicals, lumps and clods etc.

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5.0 SITE DATUMS

- 5.1 Initial levels either in a definite grid pattern or as directed by the Owner/Engineer shall be taken by the Contractor over the original ground prior to starting actual work.
- 5.2 The ground levels shall be taken at 5 to 15 meter intervals in level or uniformly sloping ground and at closer intervals where local mounds, pits or undulations are met with, as directed by the Owner/Engineer.
- 5.3 The ground levels shall be recorded in field books and plotted on a plan, which shall be signed by the Contractor and the Owner/Engineer before earthwork is started.
- 5.4 These initial levels shall be used for preparing cross-sections for volume measurement or for cross-checking the depths obtained from measurements.

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6.0 SETTING OUT

- 6.1 Prior to the commencement of work, the Contractor shall prepare and submit to the Owner/Engineer, detailed drawings for excavation and filling work, as proposed to be executed by him, showing the details of slopes, approaches, dewatering sumps, berms etc.
- 6.2 On receiving the approval from the Owner/Engineer with modifications and corrections if necessary, the Contractor shall set-out and construct permanent base lines and bench marks indicated in the drawings or as required by the Owner/Engineer. These permanent points will be checked and certified by the Owner/Engineer for Contractor to proceed with the work.
- 6.3 Necessary profiles with pegs, bamboo and strings shall be made to show the correct formation levels before the work is started.
- 6.4 Owner shall be provided with necessary men, material and instruments for such checking. It should be noted that this checking by the Owner prior to start of the work will in no way absolve the Contractor of his responsibility of carrying out the work to true lines, levels and grades as per drawing and subsequent corrections, if any.

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7.0 CLASSIFICATION OF EXCAVATED MATERIALS

7.1 Materials involved in earthwork shall be classified under the following categories. No distinction will be made whether the material is dry or wet. The Owner/Engineer decision with regard to such classification shall be final and binding on the Contractor:

a) Ordinary and hard soil

This shall include the top soil supporting terminal growth, clay, silt, sand, moorum, shingle, kankar, gravel, loam, peat, ash and other similar materials in soft, hard or dense state which can generally be excavated with ordinary spade, pick axe, shovel etc. and does not require the use of wedges, pneumatic breaking equipment and/or blasting for removal. It shall also include loose rock boulders present in the soil, with dimensions not exceeding 500 mm in any direction.



Breaking of consolidated brick ballast and mud concrete shall be considered equivalent to excavation work under this type of soil.

b) Soft and decomposed rock

This shall include rocks like chalk, slate, mica schist, Laterite and other similar materials which in the opinion of the Owner/Engineer is rock, but does not require blasting for removal and could be removed with picks, hammers, crow bars, pneumatic hammers, scrapers equipped with rock ripping teeth, tractor mounted rippers, face shovels, crane excavators, etc. It shall also include boulders with dimensions greater than 500 mm but not exceeding 1000 mm in any direction.

The mere fact that the Contractor resorts to blasting for his own convenience shall not mean that the rock material will be classified as hard rock.

Excavation in macadam, roads and pathways, brickwork etc. shall be considered equivalent to this type of soil.



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c) Hard rock requiring blasting

This shall include rocks occurring in large masses which cannot be removed only by drilling and blasting. Harder varieties of rock such as trap, with or without veins and secondary mineral which in the opinion of the Owner/Engineer require blasting for removal shall also be considered as hard rock. It shall also include boulders bigger than 1000 mm in any direction.


Construction in concrete, both reinforced and unreinforced, which is required to be dismantled during earthwork, shall be considered equivalent to this type of soil, unless a separate provision is made in for the same.

d) Hard rock requiring blasting but where blasting is prohibited, this shall include hard rock's which will normally require blasting for their removal but blasting is prohibited and removal has to be done by chiseling, wedging or any other suitable method.

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8.0 CLEARING AND GRUBBING

- 8.1 The area to be excavated shall be cleared out of fences, logs stumps, bush vegetation, rubbish, slush, etc. and leveled up. Trees upto 300-mm girth shall be uprooted. Trees above 300 mm girth that are required to be cut, shall be got identified by the as marked, and are to be cut only after specific return approvals.
- 8.2 Existing foundations, drainage, pits, manholes (if any) which are no longer required, shall be broken out and the excavations filled and compacted.
- 8.3 Felling of trees shall include taking out roots upto 1000 mm below ground level. After the tree is cut and roots taken out, the pot-holes formed shall be filled with good earth in 250 mm layers and compacted to acceptable degree unless directed by the Owner/Engineer otherwise. The trees shall be cut in suitable pieces as instructed by the Owner/Engineer and transported to the Owner's store or any other space as directed by the Owner/Engineer.
- 8.4 Before earthwork is started, all the spoils and unserviceable materials and rubbish shall be burnt or removed from the site to approved disposal areas as may be specified. Ash shall be spread or removed as directed by the Owner/Engineer.
- 8.5 Useful materials, saleable timber, firewood, etc. shall be the property of the Owner and shall be stacked properly at the worksite in a manner as directed by the Owner/Engineer, and to be transported to the Owner's stores or any other place as directed by the Owner/Engineer.

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9.0 EARTHWORK IN EXCAVATION

9.1 Rough Excavation

Excavation not requiring dressing of sides and bottom and reduction to exact levels, such as obtaining earth from borrow-pits, hill side cutting, etc. shall be covered under this category.

9.2 Excavation in trenches for foundations/pipes/cables, etc. open cuts and bulk excavation.

9.2.1 All excavations shall be done to the minimum dimensions necessary to carry out the work safely. Prior approval of the Owner/Engineer shall be obtained by the Contractor, in each case, for the method he proposes to adopt for the excavations including dimension, side slopes, dewatering, disposal etc. This approval, however, shall not in any way make the Owner responsible for any consequent loss or damage.

9.2.2 Excavation shall be carried out to such widths, lengths, depths and profiles shown on the project drawings or such other lines and grades specified by the Owner.



9.2.3 Rough excavation shall be carried out to a depth 150 mm above the final level. The balance shall be excavated with special care just prior to laying of leveling course of concrete.

9.2.4 Soft pockets shall be removed even below the final level and extra excavation made up to the required level as directed by the Owner/Engineer.

9.2.5 If the excavation is done to a depth greater than that shown on the drawing, due to the Contractor's fault, the excess depth shall be filled up to the required level at the latter's cost with selected earth and compacted to 97% of modified Proctor Density.

9.2.6 As the excavation reaches the required dimensions, the work will be checked by the Owner/Engineer and the balance work shall be carried out carefully to avoid any over-excavation.

9.2.7 Suitable berms shall be left at the appropriate places with necessary approach ramps for

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installation of dewatering pumps or other purposes, as required and or as directed by the Owner.

9.2.8 The berms shall be excavated later and the excavation finished to the lines and grades shown in the drawings and to the satisfaction of the Owner.

9.3 Stripping Bluffs And Loose Rock

9.3.1 All loose boulders, semi-detached rocks not directly in the excavation but so close to the area to be excavated which in the opinion of the Owner/Engineer could endanger the workmen, equipment, or the work shall be stripped off and removed away from the areas of the excavation.



9.3.2 Any material not requiring removal as contemplated in the work, but which in the opinion of the Owner, is likely to become loose or unstable later, shall also be promptly and satisfactorily removed as directed by the Owner.

9.4 Stability Of Excavation

9.4.1 The methods of excavation shall in each case be approved by the Owner/Engineer. The work shall be carried out without endangering the safety of nearby structures, works, roads, railway tracks, cables pipelines etc if any, and without causing hindrance to other activities in the area.

9.4.2 Unless otherwise agreed by the Owner/Engineer, all excavations shall have vertical sides and shall be safely supported.

9.4.3 The Contractor shall have full responsibility for the stability of excavation and safety of workmen. If any slip occurs, the Contractor shall remove all the slipped material from the excavated area/pit, at his own cost. Also, if any damage to the built up structure occurs because of the slip, the Contractor shall make it good at his own cost.

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9.5 Shoring Of The Excavated Area

9.5.1 Shoring shall be close or open type depending on the nature of soil and the depth of pit or trench. Contractor shall take all necessary steps to prevent the sides of trenches and pits from collapsing.

9.5.2 Close Shoring / Bracing



- a) 'Close' type shoring shall be as specified in IS: 3764 or as per International safety codes for excavation work. Shoring required for deep excavations shall be designed by the Contractor and got approved by the Owner/Engineer prior to its use in the work.
- b) The withdrawal of the shoring material shall be done very carefully to prevent the collapse of the pit or trench. It shall be started at one end and preceded systematically to the other end. No part of the work should be damaged during the removal of the shoring material.
- c) No claim will be entertained for any shoring material or installation that of.

9.5.3 Open Shoring / Bracing

- a) In case of open shoring / bracing the entire surfaces of the side of trench or pit is not required to be covered.
- b) Vertical boards of minimum 250 mm x 40 mm sections or equivalent section shall be spaced sufficiently apart to leave unsupported strips of maximum 500 mm average width.
- c) The detailed arrangements, sizes of the shoring material and the spacing shall be subjected to the approval of the Owner. In all other aspects, specification for close shoring shall apply to open shoring also.

9.5.4 Left in shoring Material

If the Owner/Engineer directs any shoring to be left in place for the safety of the structure or otherwise for reasons commensurate with the type of construction necessitating such decision.

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9.6 Clearing Of Excavation



- 9.6.1 Excavation shall be cleaned, trimmed to exact shape and all disturbed materials and other debris removed.
- 9.6.2 When the excavations have been taken out to the lines specified or shown on the drawings and the surface cleaned as specified, the contractor shall notify the Owner/Engineer that the excavation is ready for inspection and no further work shall be done with concrete or backfill until it has been inspected and approved by the Owner.
- 9.6.3 Cost of this work is deemed to have been included in bid price.

9.7 Precious Object, Relics, Objects Of Antiquity, Etc.

All gold, silver, oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or on the site shall be the property of the Government and Contractor shall duly preserve the same to the satisfaction of the Owner/Engineer and deliver the same to such person or persons authorized to receive the same.

9.8 Use Of Excavated Material As Fill

- 9.8.1 Excavated material suitable for use in a particular section of the work as fill or backfill shall be selected, loaded, hauled, placed spread and used to construct the fill or backfill to the lines and grades specified for the work.
- 9.8.2 As far as possible, the most suitable of the materials excavated for the work shall be used to construct the fill and backfill, embankment, roads, and storage areas where required.
- 9.8.3 The useful rock available shall be stacked at locations as decided by the Owner/Engineer.

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9.9 Disposal Of Surplus Material


- 9.9.1 All surplus materials shall be carried away from the site and disposed at dumping sites specified or selected by the Owner/Engineer.
- 9.9.2 The Contractor shall dump the excavated materials in regular heaps, bunds, blankets, riprap with regular slopes as directed by the Owner/Engineer. As a rule, all softer material shall be laid along the centre of heaps, the harder and more weather resisting materials forming the casing on the sides and the top.
- 9.9.3 Excavated rocks which can be used in soling, as road metal or for making concrete aggregates, shall be stacked separately as directed by the Owner/Engineer.
- 9.9.4 All works as mentioned above is deemed to have been taken into account while quoting for the excavation and no extra shall be claimed by the Contractor for the above works.
- 9.9.5 If the Contractor wants to use the rock excavated from pits, he shall obtain approval for the same from the Owner/Engineer.

9.10 Stockpiles

- 9.10.1 The excavated materials shall be stockpiled at approved locations adjacent to the work until their use is authorized for placement in backfill.
- 9.10.2 As a general rule the excavated material shall not be deposited within 1.5m from the top edge of the excavation or within a distance equal to the depth of excavation, whichever is higher.

9.11 Spoil Areas

- 9.11.1 Unsuitable materials either excavated from the works or brought from borrow pits shall be disposed of in spoil areas shown on the drawings or as specified by the Owner.

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9.11.2 The spoil areas shall be left in a neat and good condition and sloped to drain properly as may be directed by the Owner.

9.12 Dewatering

9.12.1 All areas shall be kept free of water. Grading around the excavations shall be to prevent surface water running into excavated areas.

9.12.2 The Contractor shall remove by pumping or other means approved by the Owner/Engineer any water inclusive of rain water and sub-soil water accumulated in the pit/trench/area without any extra cost. Contractor shall get Method of dewatering approved by the Owner/Engineer.

9.12.3 If pumping is necessary, precautions shall be taken to prevent the removal of fine materials from the excavated bottom or sides during dewatering operations.

9.12.4 If necessary, excavated level shall be further excavated to a sound bottom and backfilled to level with mass concrete or compacted granular material.



9.13 Treatment Of Slips

9.13.1 The Contractor shall take all precautions to avoid high surcharges and provide proper surface drainage to prevent flow of water over the sides. These precautions along with proper slope, berms and control of ground water should cause no slips to the excavated trench.

9.13.2 Slips caused during construction work shall be cleared and backfilled later by Contractor.



9.14 Excavation In Hard Rock

9.14.1 In case where excavation, both in ordinary soil and hard rock, are involved, the ordinary soil comprising of soft, hard and dense soils and weathered disintegrated rocks which can be excavated without blasting, shall be completely stripped off and the starting levels of hard

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rock surface taken to enable measurements. Further work in hard rock shall be resumed after clearance from the Owner/Engineer.



- 9.14.2 Personnel deployed for rock excavations shall be protected from all hazards such as loose rock/boulder rolling down and from general slips of excavated surfaces. Where the excavated surface is such that it is not stable against sliding, necessary supports, props, bracing or bulkheads shall be provided and maintained during the period of construction.
- 9.14.3 In case where blasting is prohibited for some reason, though otherwise required, the excavation shall be carried out by chiseling, wedging or any other approved method.
- 9.14.4 In trenches, pits and drains where blasting is not prohibited, the excavation in hard rock shall be carried out by blasting in the first instance and finally by chiseling so as to obtain the correct section of the trench as per drawing.
- 9.14.5 Blasting operations, if required and permitted by the Owner/Engineer, shall be carried out as per Standard international specifications and safety codes.

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10.0 EARTHWORK IN FILLING

10.1 Area Filling For Grading

- 10.1.1 The material to be used for area filling shall be selected material, approved by the Owner/Engineer. Natural ground levels must be observed before start of any cutting or filling activity and level sheet should be signed jointly.
- 10.1.2 Crushed rock shall be graded with sufficient fine material to ensure proper binding on compaction.
- 10.1.3 Fill shall not be placed on frozen surfaces.
- 10.1.4 No earth fill shall commence until surface water discharges and streams have been properly intercepted.
- 10.1.5 Filling shall start at the lowest level of the slope and progress up the slope in horizontal layers. Under no circumstances shall fill be placed in sloping layers.
- 10.1.6 Before commencement of area filling, the existing topsoil shall be removed upto a minimum depth of 150mm, or more, in order to clear the surface from undesirable materials. After this, the filling operation shall be performed with earth in layers not exceeding 150mm, loose thickness. Each layer shall be watered and properly compacted to 95% modified Proctor Density unless otherwise permitted/directed by the Owner/Engineer.
- 10.1.7 When rock material is used, the thickness of the layer may be increased to 450mm loose depth provided that the material grading is within that specified or approved by the Owner/Engineer.
- 10.1.8 Fill shall be compacted with approved machine. Manual compaction shall not be allowed unless authorized by the Owner/Engineer. Manual compaction may be with wooden or steel rammers of 7 to 10 kg weight having a base of 200mm square or 200mm diameter.

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10.1.9 Since the degree of compaction depends on the moisture content of the soil, a close watch shall be kept on this aspect and corrections done to optimize the moisture content.

The adequacy of the compaction and moisture control of the soil shall be determined by performing field density tests and other tests as and when directed by the Owner/Engineer and shall conform to the stipulations laid down in IS : 4701 / or any standard international codes.

10.1.10 Field compaction test shall be carried out at different stages of filling and also after completing filling to the entire height. This shall hold good for embankments as well.



10.1.11 Filling shall be carried out to the dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

10.2 Filling And Compaction In Pits And Trenches Around Structures

10.2.1 As soon as the work in foundations has been accepted and measured, the space around the foundation structures in pits and trenches shall be cleared of all debris, brick bats, mortar droppings, etc., and filled with selected earth in layers not exceeding 150mm. Each layer shall be watered, rammed and properly consolidated to the satisfaction of the Owner/Engineer.



10.2.2 Earth shall be rammed with approved mechanized compaction machine. Usually, no manual compaction shall be allowed unless specifically permitted by the Owner/Engineer. The final surface shall be trimmed and leveled to proper profile as desired by the Owner/Engineer.

10.2.3 Since the degree of compaction depends largely on the moisture content, a close watch shall be kept to ensure optimum moisture content.

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10.3 Filling In Disposal Areas

- 10.3.1 The earth shall not be dumped haphazardly but shall be spread in horizontal layers not exceeding 500mm in thickness and nominal compaction done to the satisfaction of the Owner/Engineer.
- 10.3.2 All lumps and clods shall be broken before placing the fill. Earthmoving machinery including dumpers, dozers and trucks shall be allowed to ply over the fill to permit compaction to take place.
- 10.3.3 In wide areas, rollers may be employed and nominal compaction done to the satisfaction of the Owner/Engineer.

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11.0 LIGHTING

11.1 Full-scale area lighting is to be provided if night work is permitted or directed by the Owner/Engineer.

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12.0 TESTING AND ACCEPTANCE CRITERIA



12.1 Excavation

12.1.1 On completion of excavation, the dimensions of the area will be checked as per the drawings after the area is completely dewatered. The work will be accepted after all undercuts have been set right and all over excavations filled back to required lines, levels and grades by compacted earth or other means, at the Contractor's cost. Over excavation of the sides will be made good free of cost by the Contractor.

12.1.2 The excavation work will be accepted after the above requirements are fulfilled and all temporary approaches encroaching inside the required dimension of the excavation have been removed.

12.2 Area Filling and Back Filling

The degree of compaction required will be as per the stipulations laid down in appropriate sections of this specification. The work of area filling will be accepted after the Owner/Engineer is satisfied with the profile of the fill and degree of compaction achieved.

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13.0 TERMITE CONTROL

13.1 Description

The work consists of providing termite control treatment in foundations, plinth and under floors with the solution of Bayer Carpenter Ant and Termite Killer Plus of Bayer Advanced or as approved by owner.

13.2 Construction Requirements

13.2.1 Extent of Application

Unless otherwise specified all sides of structural members below floor level and bottoms of excavated trenches/pits, floors beds and underside of plinth protection are to be sprayed with the solution.

13.2.2 Preparation of Solution

As per manufacturer recommendations.


13.2.3 Method of Application

The solution shall be applied with approved pressure spraying equipment maintaining an adequate pressure to all applications to, on or in the earth. Solution shall also be sprayed in trenches around the building under plinth protection. Pesticide shall penetrate to a depth of 25 mm (1") minimum in porous earth at sides and 50 mm (2") to 75 mm (3") at bottoms of excavation and floor beds. After back-filling to plinth level, the area is again to be sprayed with pesticide solution. Wherever wooden/ply surfaces are to be treated by spraying, it shall be carried out with approved hand compression sprayer at the specified pressure as per instructions.

13.2.4 Rate of Application:

The pesticide solution shall be applied as per manufacturer recommendations.

13.2.5 Precaution

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The contractor shall take extreme care to avoid any mishap due to the injurious effects of the chemicals and shall keep the "Owner" indemnified from any losses, damages or expenses in this connection whatsoever.

13.3 Measurement and Payment

The measurement shall be made in sq.m/sq.ft. by measuring and multiplying length into breath/height/depth of the actually treated surface by spraying the solution.

13.3.1 Payment

The payment shall be made in Sq.m/Sq.ft. of the actual work done as measured above at the corresponding unit rate given in BOQ.

Note: The General Contractor has to engage an approved Specialist Contractor for the purposes of Termite proofing.

APPENDIX-A14



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

SPECIFICATION FOR ELECTRICAL EARTHING PHILOSOPHY DOC. NO: 0504196-ELE-SP-001

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Disclaimer

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	STR	SAG	Adeel	Feb 01 th , 2021		




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<p>Doc. No: 0504196-ELE-SP-001</p>	<p>EARTHING PHILOSOPHY</p>	<p>Revision No. 1</p>

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1 OBJECTIVE

This document defines technical basis, parameters and criteria used for calculation of required number of Earth Pits and Earthing Conductor sizes for Detail Engineering.

2 REFERENCE DOCUMENTS, CODES AND STANDARDS



Unless specifically stated otherwise, the grounding calculations are based on the applicable parts of the latest revision of the following codes, specifications, standards, regulations and other documents. In addition, the layouts will comply with any laws or regulations of local authorities:

BS-7430:1998 Code of practice for Earthing

3 STUDY OBJECTIVE

The most important objective of this study is to ensure safety. The grounding system is designed to ensure low resistance path to the ground.

- To ensure safety of personnel
- To minimize hazard from transferred potential
- To protect equipment insulation
- To provide discharge path for lightning strikes
- To provide low resistance path to ground
- Calculation of required number of earth pits and earthing rods.
- Earthing system layout.

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4 DESIGN REQUIREMENTS

4.1 General

The Electrical earthing system shall be suitable to protect the electrical network and assure personnel and equipment safety in case of earth faults in electrical system, build up of electrostatic charges and atmospheric discharges.

For earthing of electrical systems, equipment and structures, the earthing system shall have common earth grid connected to number of earth electrodes. The earth grid shall comprise of bare stranded hard drawn copper conductor and branch connections shall be Yellow/Green PVC insulated single core stranded copper conductor cables. The above ground connections shall be of compression type and underground connection shall be thermo weld type.


The earth grid shall be installed throughout the plant site in the form of earth ring with branch interconnections to the equipment and structures. Clean earth shall be used for Instrumentation system earthing.

The Generators are grounded through Neutral Grounding Resistor (NGR). The neutral points of star-connected side of the generators are connected to the earth grid with impedance intentionally inserted in between. This is implemented to limit the ground fault currents for the equipment and personnel safety and continuous reliable operation.

4.2 Earthing of Electrical/non Electrical Equipment

Cross sectional area of earthing rings and branch conductors (connecting equipment and structures to plant earthing ring) shall be as follows:

Around Switchgear Room & Gen sets	240 mm ²
Plant earthing ring conductor (min)	70 mm ²
Metallic enclosures of MV electrical equipment	70 mm ²
Lightning arrestors	70 mm ²
Metallic enclosures of LV electrical equipment	70 mm ²
(Power Supply Cable 35 mm ² or greater)	
Metallic enclosures of LV electrical equipment	25 mm ²

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(Power Supply Cable 35 mm² or smaller)

Control panels & distribution boards	25 mm ²
Skids at two points situated at diagonally opposite corners	70 mm ²
Lighting poles	25 mm ²
Non electrical equipment e.g. tanks & vessels etc.	35 mm ²
Non electrical equipment e.g. columns & structures etc.	70 mm ²
Fence	35 mm ²
F&G poles	10 mm ²

4.3 Instrumentation System Earthing

The computer & the instrumentation system shall be provided with separate earth from the electrical earthing system. This shall be done by triangular arrangement of three earth rods that are tied together via copper conductor. All instrument earth points shall be connected to clean earth. The instrument earth shall be provided in the control room.

4.4 Ohmic Value

The electrical resistance between the earth grid and general mass of earth shall not exceed 5 ohm when anyone group of electrodes is disconnected.

APPENDIX-A15



OIL & GAS DEVELOPMENT COMPANY LIMITED

0504196 – MARU RETI COMPRESSION

SPECIFICATION FOR LIGHTNING PROTECTION PHILOSOPHY DOC. NO: 0504196-ELE-SP-002

ENGINEERING CONSULTANT:



Petrochemical Engineering Consultants

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Disclaimer

This Specification has been prepared on behalf of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and for the exclusive use of (OGDCL) OIL & GAS DEVELOPMENT COMPANY LIMITED and is subject to and issued in accordance with the agreement between Petrochemical Engineering Consultants (PEC) and OGDCL. PEC accept no liability or responsibility whatsoever for it in respect of any use of or reliance upon this Specification by any third party.

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Final Issue	STR	SAG	Adeel	Feb 01 th , 2021		

 <p>OIL & GAS DEVELOPMENT COMPANY LIMITED</p>	<p>MARU RETI COMPRESSION</p>	 <p>Petrochemical Engineering Consultants</p>
<p>Doc. No: 0504196-ELE-SP-002</p>	<p>LIGHTNING PHILOSOPHY</p>	<p>Revision No. 1</p>

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1.0 INTRODUCTION

The specification describes the minimum requirements for the design, selection, sizing, testing and inspection of lightning protection system. In case of any conflict between the specification and standards the most stringent shall prevail.

When large currents flow from the lightning strikes, it can produce sparks in vicinity of the point of impact. Even in the absence of lightning strikes, thunderstorms can cause high induced voltages in equipments, protective systems and components. The Lightning arrestor shall limits the amplitude and duration of disturbing interference voltages and improves the over voltage resistance of in-line equipment, systems, and components.

A lightning protection system shall have to meet or exceeds the requirements of the following standards and the local regulations or best practices applicable to lightning protection system with latest editions.

API RP 2003

NFPA 780

IEC 62305

NFC 17-102

UL 96A

BS 6651

LPI 175

IEC 61024

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2.0 RESPONSIBILITY

It is emphasized that this specification indicates the basic requirements and does not relieve the Contractor / Sub Contractor / Vendor from their responsibilities in including whatever necessary as per good engineering practices, for the design adequacy, availability, reliability and the safe/accurate operation of the supplied equipment.

Contractor / Sub Contractor / Vendor is responsible for correctness & completeness of makes, Compatibilities, Models, Quantity, types of components, services & documentation quoted / included in scope, since Contractor / Sub Contractor / Vendor has full details of his / offered system.

It is incumbent upon Contractor / Sub Contractor / Vendor to fulfil requirements agreed upon before order, even if any of the requirements are missing or left out in Order scope

Contractor / Sub Contractor / Vendor shall if necessary, change Makes, Models, Number of Quantity, add, rectify / Replace / Modify & provide additional services as needed in order to fulfil agreed requirements. This he shall do so at his cost & at no extra cost to be incurred upon the Client, even if all makes models, documents, and drawings had been approved before or after order.

Contractor/Sub Contractor/Vendor's supply shall include all the necessary components,
Factory Acceptance Tested (FAT), Site Acceptance Tested (SAT) before handing over.

3.0 GENERAL

Connect the lightning arrestor components directly to the grounding point. The connection length should be as short as possible.

The contact points of the ground connection must be clean and free of dust and moisture. Tighten threaded contacts to the torque specified by the manufacturer

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recommended values.

The electric cable used for connecting lightning protection system to earthing system shall be minimum 70 mm² insulated copper wire.

The lightning protection system shall be installed in outdoor forest landscape where ambient temperature is between 0°C to 50°C.

Materials for lightning protection system shall be inherently resistant to corrosion or properly protected against corrosion. No materials shall be combined which form an electrolytic coupling that accelerates corrosion, such as copper-aluminum couplings. Alloyed metals used shall be substantially as resistant to corrosion and have the same conductivity as copper under similar conditions. Material such as galvanized steel is not acceptable except as specified by standards / Engineering Practices.

The lightning protection system shall be capable of protecting from direct / indirect lightning strikes.

The specification recommends adopting a striking distance of 45 m.

4.0 DESIGN

The contractor shall define the minimum and maximum protection radius of lightning strikes to the structures, equipments or lines etc. The contractor shall define the Lightning protection zone based on local conditions and according to the standards/national regulations.

The arrester selection and design process should include a review of all system stresses, service conditions expected, and system-grounding configuration (grounded or effectively ungrounded) at the arrester installation location. If arresters of different ratings are required to meet these individual criteria, then the highest resulting arrester rating should be chosen.

The protector should limit transient over voltage to less than the equipment damage level. The peak transient let-through voltage should not be exceeded for

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all combinations of conductors.

All metal work, including water pipes, gas pipes, handrails, air conditioning units, metal cladding, metal roofs etc, in the vicinity of the Lightning Protection System must be bonded to it, to avoid the danger of side flashing.

The Lightning Protection System earth should be bonded to the main electrical earth, as well as any other earthing system present in the structure.

Air terminals shall be 8 3/8 -inch minimum diameter for solid copper or 12-inch minimum for solid aluminium. Air terminals shall extend above the protected object at least 10 inches but no more than 36 inches. If over 24 inches high, air terminals shall be suitably braced.

No less than two down conductors with a proper ground for each shall be provided on any structure.

Down conductors shall be guarded in such a manner as to prevent physical damage or displacement, to a distance not less than 6 feet above ground level. If run through conducting pipe or tubing (of compatible metal), the conductor should be bonded to the conduit at top and bottom.

5.0 SIZING

The Lightning Protection system shall accommodate surges of upto 50 kA, 1200 Kva and frequency band 10kHz to 50MHz and shall have a minimum service life of 30 years. The protector should be rated for a peak discharge current of not less than 10kA, 8/20 microsecond waveform (8s rise time/20s 3dB pulse width).

6.0 SELECTION

The primary objective in selection of arresters application is to select the lowest

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rated surge arrester that will provide adequate protection of the equipment insulation and be rated such that it will have a satisfactory service. An arrester of the minimum practical rating is preferred because it provides the highest margin of protection for the equipment insulation system. Higher arrester ratings will increase the capability of the arrester to survive on a specific power system but reduce the margin of protection provided for the insulation level of the equipment it is protecting. Therefore, the contractor should consider both issues of arrester survival and equipment protection when selecting lightning arresters.

Lead length for the connection of the lightning arrester to the equipment terminals and to ground should be minimized and installed as straight, minimizing bends in the leads, as possible. This will ensure that the surge energies are shunted to ground by the most direct path. Increases in the lead length will reduce the protection capabilities of the surge arrester, due to the additional increase of impedance in the lead.

There is some basic considerations shall be consider by the contractor when selecting the appropriate lightning arrester.

The 'Zone of Protection' offered by an air termination network is considered to be 45° for heights up to 20m. Above this height, the zone of protection is determined by the 'Rolling Sphere Method'. This involves rolling an imaginary sphere of 60m radius over a structure. The areas touched by the sphere are deemed to require protection.

Each down conductor must have a separate earth termination. Moreover provision should be made in each down conductor, for disconnection from the earth for testing purposes. This is achieved with a test clamp. The specification/standards recommends that the resistance to earth of the lightning protection system measured at any point, should not exceed 10 ohms.

With the test clamp disconnected, the resistance of each individual earth should be no

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more than ten times the number of down conductors in the complete system. e.g. for a system with 15 down conductors, the individual earth readings should be no more than $10 \times 15 = 150$ ohms.

Several types of earth electrode are permissible, but by far the most commonly used are deep driven earth rods. The specification/standards states that the combined earth rod length of a system should be no less than 9m whilst each individual earth rod should be no less than 1.5m in length.

7.0 CORROSION

The correct choice of material and installation design should ensure a life span of 30 years for the earth electrode system. If this check is not carried out then vital components within the Lightning Protection System, which may have suffered from corrosion and which could exhibit a high resistance could be missed. This will have a detrimental effect on the whole system making it an unattractive high impedance path for the lightning current to follow.

To minimise this problem, along with regular inspections, the selection of the correct materials should be made in accordance with the recommendations of these specifications/standards.

Lightning Protection System is intended to intercept direct strikes to the structure (air termination system, including the sides of the structure), to conduct the lightning current to the earth (down-conductor system) and to disperse it into the earth (effective earth termination system). A full Lightning protection system will protect against lightning surges as well as against radiated magnetic fields.

8.0 Grounding

Minimum acceptable ranges for each ground electrode shall be a copper-clad steel rod at least 21 inch in diameter and 10 feet long. Rods of solid copper 12 inch in

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diameter may be used in lieu of copper-clad steel. Stainless steel ground rods are also acceptable where acid soil conditions exist or other conditions warrant substitution of stainless steel.

Connections to ground electrodes shall be made at points not less than one foot below grade and two feet out from the foundation. In moist clay, the ground shall extend vertically not less than 10 feet into the earth, and the earth shall be tamped along the full-length of the ground.

In shallow top soil where bedrock is near the surface, the lightning conductor (extensions of the down conductors) shall be laid in trenches extending away from the building. Trenches shall be at least 12 feet long and one foot deep in clay soil, and at least 24 feet long and 2 feet deep in sandy or gravelly soil.

In moist sandy or gravelly soil of ordinary soil depth, 2 electrodes shall be driven at least 10 feet deep at each ground. The conductor shall be extended out from the building in a trench at least 2 feet from the wall. The two electrodes shall not be spaced more than 6 feet apart.

All underground metallic piping, including water piping, well casings, sewer and septic lines, shall be connected to the grounding system with main size conductors and special fittings. A lightning arrester shall be installed on the lead-in wire, tape or cable and bonded to the lightning protection system directly or through a common ground.

9.0 INSPECTION

All lightning protection systems should be visually inspected by a competent person

during installation, after completion and after alteration or extension, in order to verify that they are in accordance with the recommendations in these specifications / standards. Visual inspections of the installation and of the lightning surge

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arrestors should be repeated at fixed intervals not exceeding 12 months.

In addition, the mechanical condition of all conductors, bonds, joints, terminations and earth electrodes (including reference electrodes) should be checked and the observations noted. If, for any reason, such as site works, it is temporarily not possible to inspect certain parts of the installation, this should also be noted.

During periodic inspection of the lightning protection system, the bonding of any recently added services should be checked to ensure that they are in accordance with these specifications.

10.0 TESTING

On completion of the installation or any modification to it, the following measurements and/or checks should be made and the results recorded in a lightning protection system logbook:

The resistance to earth of the earth termination network and of each earth electrode;

The results of a visual check on all conductors, bonds and joints or their measured electrical continuity.

The resistance of each earth electrode should be measured with that electrode disconnected from the rest of the lightning protection system and the results recorded.

The current test electrode (TE1) should be inserted into the ground some 30 to 50 meters from the lightning earth electrode under test. Initially, the voltage electrode (TE2) should be inserted about midway between E and TE1. The earth electrode resistance should be measured and recorded. Two further readings should be taken and recorded with TE2 placed 7 meters closer to and then 7 metres further from E. This process should be repeated until the three readings agree within the

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required accuracy.

If the resistance to earth of the lightning protection system exceeds 10 ohms except on rock or if the resistance of an individual electrode exceeds 10 ohms multiplied by the total number of electrodes, the value should be reduced. If the resistance is less than 10 ohms but significantly higher than the previous reading, the cause should be investigated and any necessary remedial action taken.

Where possible, two permanent test electrodes should be provided. Earth electrode resistance measurements should be made and recorded using these test electrodes.

Where this is not possible (e.g. on a rock station) then each earth electrode should be disconnected in turn and the resistance between the isolated electrode and the rest of the system measured and recorded.

It is emphasized that before disconnecting a lightning protection earth, it should be tested to ensure that it is not 'live', using a sensitive voltage testing device.

It may be advantageous to choose a period slightly less than 12 months in order to vary the season in which the tests are made.

The presence of buried conductors can considerably influence the results of earth electrode resistance measurements. Every effort should be made to locate these services and, wherever possible, select a measurement site away from these services.

When gapped type arresters fail, the contractor should consider or recommend replacing them with the metal-oxide gapless type.

11.0 PROCEDURE

Contractor / Sub Contractor / Vendor shall also discuss / explain to the Client the

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details, incorporate Client's comments / suggestions ; get their approval before proceeding to implement the same.

12.0 DRAWING / DOCUMENTS

Contractor / Sub Contractor / Vendor shall submit the final termination Diagram for approval of Client/ Owners Representative. If during approval it is found that Contractor / Sub Contractor / Vendor to add new components / develop / alter the Functional Logic of the software, Contractor / Sub Contractor / Vendor shall do so without any cost implication.



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - IV)

FORM OF CONTRACT

FOR

HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENTS WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)

(0504196-BTD-004)

CONSULTANTS

August, 2021





Petrochemical Engineering Consultants

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	OGDCL APPROVAL	DATE
A	Issued for Tender	IM	SAR	Adeel	20 th Aug, 2021		

	MARU-RETI COMPRESSION PROJECT			
	Doc. Title:	Tender Document for Services of PC Contractor		
	Doc. No:	0504196-BTD-004	Section IV	

FORM OF CONTRACT

This Contract (hereinafter referred to as “Contract”) is made this ____ day of _____ 2021 by and between Oil & Gas Development Company Limited having its Head Office situated at OGDCL House, Blue Area Jinnah Avenue, Islamabad (hereinafter referred to as “OGDCL”, which expression where the context admits shall include and mean its successors in interest and assigns) of the FIRST PART and M/s. _____ having its registered office at _____ (hereinafter referred to as “PC Contractor” which expression whereas the context admits shall include and mean its successors and assigns) of the SECOND part.



WHEREAS OGDCL as Owner & Operator has been proceeding to implement Maru-Reti Compression Project at Maru-Reti Gas field. As part of this project, OGDCL intends to hire services to Procure (Supply) Bulk piping, Electrical & instrumentation material, Construct, Fabricate, Install/Erect, hook-up, Pre-Commission and Commission the complete Civil, Electrical, Mechanical and integration Works as well as construct, install/erect, assemble, Pre-commission; commission & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project (hereinafter referred to as “Project”), on item-wise price/Unit rate basis for _____ Months/Years.

WHEREAS OGDCL invited Bids for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project.

AND WHEREAS the PC Contractor after reviewing the available documents/drawings/specifications, and understanding the complete description/Scope of the Work and Project requirements given in the OGDCL’s Tender Document No. _____ dated _____ 2021, submitted the Bid No. _____ dated _____ 2021 and has agreed to execute the Project as per terms, conditions and specifications mentioned hereinafter.

WHEREAS the Contractor represent and warrants to OGDCL that it is fully qualified, experienced and professionally competent and possess the necessary skills and resources and is able and willing to undertake the required Work, strictly so as to achieve the objective of the Contract.

WHEREAS OGDCL through letter no. _____ dated _____ communicated its intention to award the Contract for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-

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commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project for _____ Months/Years on item-wise price/unit rate basis.

PC CONTRACTOR & OGDCL hereby agree to enter into item-wise price/Unit rate basis Contract for _____ Months/Years for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project for a period start from _____ (effective date of Contract) up till _____.



NOW THEREFORE IN CONSIDERATION OF THE ABOVE PREMISES AND THE MUTUAL COVENANTS HEREINAFTER STIPULATED THE PARTIES AGREE AS FOLLOWS:

1.0 CONTRACT & ITS OBJECT

In this Contract words and expressions shall have the same meanings as are respectively assigned to them in the conditions of the Contract hereinafter referenced.

The following documents (hereinafter called “the Contract Documents”) including this contract, their Attachments annexures, appendices and addendums shall be deemed to form and be read and construed between the parties and supersede and replace any prior correspondence, agreement or understanding between the parties:

- | | |
|--|--------------|
| a) This Contract | |
| b) Scope of work | Appendix – A |
| c) Detailed Work Schedule | Appendix – B |
| d) Bill of Quantities (BOQs)/Price Schedule | Appendix – C |
| e) Schedule of Price/Unit Rates for Additional Work | Appendix – D |
| f) Conditions of Contract | Appendix – E |
| g) Letter of Intent for Award of Contract | Appendix – F |
| h) List of IFC Drawings | Appendix – G |
| i) Potential PC Contractor’s Bid Proposal (Technical & Commercial) | Appendix – H |
| j) OGDCL/Engineering Consultant & Potential PC Contractor Correspondence (If applicable) | Appendix – I |
| k) Advance Payment Guarantee | Appendix – J |
| l) Performance Bond (Guarantee) & List of Banks | Appendix – K |

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- m) The Measurement/Verifications Mechanism of Progressive Payments Appendix – L
n) Integrity & Ethics Undertaking Appendix - M

Notwithstanding anything contained in the documents:

- To the extent of any conflict between this Contract and Contract documents including Annexures, Appendices and Addendums, the Contract shall prevail.
- To the extent of any conflict between Specifications in the Tender Document and specification/drawings issued for construction, the later shall prevail.
- To the extent of any conflict between the Conditions of Contract and Technical Specifications, the later shall prevail; similarly, drawings/data sheets shall have precedence over technical specifications.

The object of the Contract is the performance of Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project by the PC Contractor within agreed Time Frame for Completion of project (i.e. Five (05) months from the date of establishment of L/C for supply), in strict accordance with all the requirements of the Contract and the Contractor acknowledges, agrees and undertakes that the performance of its obligations under the Contract would result in the achievement of the object of the Contract.

- 2.0 The PC Contractor shall be responsible for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project as per scope of work, BOQs, technical specifications, drawings, industry practice and in conformity with the provisions of the contract documents and as per OGDCL's objectives and requirements. The PC Contractor's scope of work is given in **Appendix-A**.
- 3.0 The timely completion of the work by the PC Contractor shall be the essence of the Contract, as OGDCL has to meet its obligations for completion of the Project. Accordingly, the PC Contractor is required to complete the Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up,

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Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project within _____ months upto the date of issuance of Mechanical Acceptance Certificate from the effective date of the Contract between OGDCL and the PC Contractor. The detailed work schedule is given in **Appendix – B.**

- 4.0 The Contract shall be for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project as per requirements stipulated in the tender document and meeting the technical specifications, applicable standards and OGDCL’s objectives and requirements. The Contract shall be on item-wise price/unit rate basis. The total Contract price shall be an estimated amount in Pak Rupees subject to variation on account of changes in quantities of items given in BOQs and for equipment/material supplied and work. The item-wise price/unit rate shall include duties, taxes and other levies etc. and shall remain fixed during the performance of the Contract. The item-wise price/unit rate shall not be subject to escalation throughout the duration of the contract period regardless of any circumstance whatsoever even unforeseeable that may affect the cost and justify therefore a price adjustment.

The PC Contractor shall be paid on item-wise price/unit rate basis as per BOQs/Price Schedule and actual quantities verified by OGDCL/Engineering Consultant. Any wastage shall be on PC Contractor’s account and no compensation shall be payable to the PC Contractor against any wastage.

In consideration of the due performance of the obligations of the PC Contractor OGDCL shall pay the PC Contractor on item-wise/unit rate basis as per BOQs & Price Schedule given in **Appendix-C.** The total estimated contract price being Rs. _____ (). The total estimated contract price shall be paid at times and in the manner prescribed in the conditions of contract.

The withholding tax deduction shall be made as per prevailing laws/regulations

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5.0 This Contract shall become effective upon the date after formal execution of the Contract by the duly authorized representatives of OGDCL and Contractor provided that all of the following conditions have been fulfilled:

- a) The submission and authentication of the Performance Bond submitted by the Contractor to OGDCL.
- b) Signing of the contract

After conditions specified above have been fulfilled and OGDCL gives written advice to PC Contractor to proceed ahead with the Work the Contractor shall diligently commence execution of the Work forthwith and shall proceed with the same with due expedition and without delay in accordance with the terms of this Contract.

The Contractor and OGDCL agree that this Contract, including all the documents incorporated by reference earlier express all of the covenants and agreements of the parties and that this Contract integrates, combines and supersedes all earlier negotiations and “Understanding” whether written or verbal. It is also understood that no modification or alteration of this Contract shall be valid or binding on either party, unless agreed in writing by both the parties.

In WITNESS WHEREOF the parties hereto have caused to be executed by their duly authorized representatives and their respective corporate seals to be affixed as of the day first written.

SIGNED, SEALED AND DELIVERED

By the said (Signature & Stamp)

By the said (Signature & Stamp)

Name: _____

Name: _____

For and on behalf of the Oil & Gas Development Company Limited (OGDCL) in the presence of:

For and on behalf of the PC Contractor in the presence of:

Name: _____

Name: _____

Address: _____

Address: _____



OIL & GAS DEVELOPMENT COMPANY LIMITED

TENDER ENQUIRY NO.: PROC-FC/CB/PROJ/MARU-RETI-5126/2021

(SECTION - V)

CONDITIONS OF CONTRACT

FOR

HIRING THE SERVICES OF PC CONTRACTOR FOR SUPPLY /
INSTALLATION / ERECTION / FABRICATION / CIVIL
FOUNDATIONS & STRUCTURE / PRE-COMMISSIONING /
COMMISSIONING & START UP ASSISTANCE OF
MISCELLANEOUS EQUIPMENTS WORKS FOR MARU-RETI
COMPRESSION PROJECT (PC)

(0504196-BTD-005)

CONSULTANTS

August, 2021



Petrochemical Engineering Consultants

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REV	DESCRIPTION	ORIG	REVIEW	PEC APPROVAL	DATE	OGDCL APPROVAL	DATE
A	Issued for Tender	IM	SAR	Adeel	20 th Aug, 2021		







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Attachments:

- Attachment-I Mechanical Acceptance Certificate
- Attachment-II Certificate of Completion
- Attachment-III Acceptance Certificate
- Attachment-IV Undertaking
- Attachment-V Certificate of Compliance
- Attachment-VI Terms and Conditions of the Inland L/C for Supply
- Attachment-VII Terms and Conditions of the Invisible L/C for Services

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CONDITIONS OF CONTRACT

1.0 GENERAL



These Conditions of Contract, together with the other parts of the Contract Documents shall apply to this Contract made between Oil & Gas Development Company Limited and ----- (PC Contractor) for carrying out Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project. This Contract shall be drawn between Oil & Gas Development Company Limited (OGDCL) and the successful PC Contractor.

These “Conditions” of the Contract shall supersede any conditions made by the Contractor, in his proposal unless such conditions have been specifically included in the Contract.

2.0 DEFINITIONS



In the Contract the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires:

- a) “Tender Documents” means the document no: **PROC-FC/CB/PROJ/MARU-RETI-5126/2021** issued by OGDCL for inviting Bids, which constitute the basis for bid proposals and the Contract.
- b) “Bid Proposal” means the offer of the PC Contractor to undertake the Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project to OGDCL in response to the tender document.
- c) “Contract” means the finally executed Contract between OGDCL and PC Contractor.
- d) “PC Contractor” means whose Bid Proposal has been accepted by the OGDCL for undertaking Procurement (Supply) of Bulk piping, Electrical &

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instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project, includes the PC Contractor's representatives, successors and permitted assignees.

- e) “Contract Documents” means the documents forming the contract and shall include:
- | | |
|--|--------------|
| a) This Contract | |
| b) Scope of work | Appendix – A |
| c) Detailed Work Schedule | Appendix – B |
| d) Bill of Quantities (BOQs)/Price Schedule | Appendix – C |
| e) Schedule of Price/Unit Rates for Additional Work | Appendix – D |
| f) Conditions of Contract | Appendix – E |
| g) Letter of Intent for Award of Contract | Appendix – F |
| h) List of IFC Drawings | Appendix – G |
| i) Potential PC Contractor’s Bid Proposal (Technical & Commercial) | Appendix – H |
| j) OGDCL/Engineering Consultant & Potential PC Contractor Correspondence (If applicable) | Appendix – I |
| k) Advance Payment Guarantee | Appendix – J |
| l) Performance Bond (Guarantee) & List of Banks | Appendix – K |
| m) The Measurement/Verifications Mechanism of Progressive Payments | Appendix – L |
| n) Integrity & Ethics Undertaking | Appendix – M |
- f) “OGDCL” referred to herein means M/s. Oil & Gas Development Company Limited.
- g) “Mechanical Acceptance Certificate” means when whole of the work have been completed mechanically, electrically, instrumentation, etc. & have satisfactorily passed the mechanical, electrical, instrumentation completion, inspection & testing and Mechanical Acceptance as described in Article 45.1.
- h) “Completion Certificate” means the Certificate to be issued by OGDCL confirming that all the works have been completed and accepted pursuant to Article 45.2.
- i) “Acceptance Certificate” means when the facilities have remained in operation for one (01) months from the issuance date of Completion Certificate as described in Article 45.3.

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- j) “Goods, Equipment and Material” means items to be procured (supplied) under the Contract.
- k) “Project Site” means the Maru-Reti Compression Project area where the work will be undertaken.
- l) “Specification” or “Specified” shall mean the requirements of the documents.
- m) “Work” means and includes all the work to be performed and all the services to be provided by the PC Contractor under the Contract.
- n) “JV” means Bid submitted by two bidders through a Joint Ventures (JV) arrangement with declaration of lead Partner and Partner incharge (JV partner) along with responsibility matrix chart.
- o) “Free Issue” means Equipment/Packages purchased by OGDCL will be issued to Contractor for transportation from warehouse/yard to installation location for erection/installation purpose.

3.0 SINGULAR AND PLURAL

Words imparting the singular only also include the plural and vice versa where the context requires.



4.0 COMPLIANCE WITH BIDDING DOCUMENTS

The Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project shall be completed in all respects and in strict accordance with the Bidding Documents.

These “Conditions” of the Contract shall supersede any conditions made by the PC Contractor, in his proposal unless such conditions have been specifically included in the Contract.

5.0 USE OF CONTRACT DOCUMENTS AND INFORMATION

- 5.1. The PC Contractor shall not, without OGDCL’s prior written consent, disclose the contents of Contract Documents, or any provision thereof, or any specification plan,

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drawing, pattern, sample or information furnished by or on behalf of the OGDCL in connection therewith, to any person other than a person employed by the PC Contractor in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.



- 5.2. The PC Contractor shall not, without OGDCL's prior written consent, make use of any document or information enumerated in Article 5.1 except for purposes of performing the Contract.
- 5.3. Any documents, other than the Contract itself, enumerated in Article 5.1 shall remain the property of OGDCL and shall be returned (all copies) to OGDCL on completion of PC Contractor's performance under the Contract, if so required by OGDCL.

6.0 SUFFICIENCY OF TENDER

The PC Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the Project and that the prices stated in the BOQ/ Prices schedule cover all his payment obligations and under the throughout term of the Contract and all matters and things necessary for the proper execution of the Project as per requirement of the Project

7.0 INTERPRETATION

- 7.1. Decision by OGDCL shall be conclusive as to the true intent and meaning of Consultant's drawings and technical specifications. Any discrepancy which may exist between drawings and the technical specifications shall be referred to OGDCL, whose decision as to the true meaning shall be final and binding for the PC Contractor.
- 7.2. The PC Contractor shall study and review the drawings, technical specifications and other information given to him by OGDCL/Consultant. During this review, if it comes across any discrepancies, inconsistencies the same shall be reported in writing to the OGDCL/Consultant.
- 7.3. All drawings and technical specifications, being instruments of services, are the property of OGDCL and shall be returned when the Work is completed
- 7.4. Verbal instructions or information received from the OGDCL office will not be recognized by him unless confirmed in writing.

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7.5. The drawings and technical specifications are intended to be complementary to each other so that any items set-forth in either shall be recognized as if duly set forth in both.

8.0 ASSIGNMENT

The PC Contractor shall not assign the Contract or any part thereof, or any benefit or interest therein or there under without the prior written consent of OGDCL.

9.0 PATENT RIGHTS

9.1. The Contractor shall indemnify OGDCL against all actions, claims, demands, costs, charges, damages and expenses arising from or incurred by reason of any infringement of patent, trade mark or industrial design rights arising from Contractor's performance under this Contract.

10.0 STANDARDS

The materials to be supplied, installation and construction work to be performed by the PC Contractor under this contract shall conform to the standards specified in the Technical Specifications and Drawings given in Section-III and Volume-2 of Tender Document, unless specified/agreed between OGDCL and the PC Contractor.

11.0 PC CONTRACTOR'S OBLIGATIONS



11.1. General Obligations

The PC Contractor shall supply, execute and complete the Works in accordance with the Contract, and shall remedy any defects in works. When completed, the works shall be fit for the purposes for which the Works are intended as defined in the Contract.

The PC Contractor shall provide the documents specified in the Contract, and all construction plant, PC Contractor's personnel, goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for completion of Work in all respects.

The Works shall include any work, which is necessary to satisfy OGDCL/Consultant's requirements, or is implied by the Contract, and all works, which (although not mentioned in the Contract) are necessary for the completion, or safe and proper operation, of the Work.

The PC Contractor shall, whenever required by OGDCL, submit details of the

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arrangements and method, which the PC Contractor proposed to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously intimated and approved by OGDCL.

11.2. **Contractor's Representative**

The PC Contractor shall appoint the PC Contractor's Representative and shall give him all authority necessary to act on the PC Contractor's behalf under the Contract.

Unless the PC Contractor's Representative is named in the Contract, the PC Contractor shall, prior to the Commencement Date, submit to OGDCL for consent the name and particulars of the person the PC Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked, or if the person fails to act as PC Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment. OGDCL may interview, nominated person before the issue of consent.

The PC Contractor shall not, without the prior consent of OGDCL, revoke the appointment of the Contractor's Representative or appoint a replacement.



The PC Contractor's Representative may delegate any powers, functions and authority to any competent person and may at any time revoke the delegation. Any delegation or revocation shall not take effect until OGDCL has received prior notice signed by the PC Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

11.3. **Sub-Contractors**

The PC Contractor shall not Subcontract the whole of the Works.

The PC Contractor shall be responsible for the acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults or the PC Contractor. Unless otherwise agreed by OGDCL, the PC Contractor shall give OGDCL not less than two (02) weeks' notice of:

- a) The intended appointment of a Subcontractor for a part of the Works, with detailed particulars, which shall include the relevant experience of the Sub-contractor whom the PC Contractor intends to appoint.
- b) Qualification and experience of the Sub-contractor's staff as may be asked by

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OGDCL.

- c) The Sub-contractor appointed by PC Contractor shall comply and meet all the requirements of Pakistan Engineering Council (PEC) Act 1976, its bye laws and amendments with respect to registration as contractor C-4 Category or above with applicable specialization codes for Civil (CE10), Mechanical (ME07) and Electrical (EE11) provide OGDCL the registration certificate & other documents to this effect.
- d) Details of manpower and other resources available with the Sub-contractor.
- e) The intended commencement of Sub-contractor's work, and
- f) The intended commencement of each Sub-Contractor's Work on Project Site.

OGDCL after reviewing the above information shall give his approval for the intended sub-contracting arrangement.

The approved Sub-contractor shall not be allowed to further sub contract the Works under his scope. If more than one Sub-Contracts are awarded to one Sub-Contractor, it shall not be managed by the same team simultaneously.



Approval of a Sub-contractor by OGDCL shall not release the PC Contractor of any of its obligation and responsibilities under neither the Contract nor OGDCL shall have any obligation with regard to the Sub-contracting arrangement between the PC Contractor and the Sub-contractor.

Approved Sub-contractor shall be responsible for carrying out the Work in accordance with the requirement of the Contract Documents, and all conditions of the Contract shall be applicable to him. Any dispute (Financial or Otherwise) between Contractor & its approved Sub-Contractor will not affect the project work at site while OGDCL shall be indemnified to resolve such disputes.

11.4. **Cooperation**

The PC Contractor shall, as specified in the Contract or as instructed by OGDCL, responsible free access at all times for carrying out inspection or work to:

- a) OGDCL's personnel,
- b) The Consultant's personnel,
- c) any other Contractors employed by OGDCL, and

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d) the personnel of any legally constituted public authorities,

who may be employed in the execution on or near the Project Site of any Work not included in the Contract.

The PC Contractor shall be responsible for execution of his works at Project Site, and shall co-ordinate his own activities with OGDCL and other contractors.

11.5. Safety Procedures



During the execution of the Work, the PC Contractor shall strictly follow OGDCL safety requirements. The PC Contractor shall also exercise due care for facilities of other parties. In any event the PC Contractor shall be liable for any damages and/or losses incurred including third party losses.

The PC Contractor shall:

- a) Comply with all applicable safety regulations (and including work permit requirements of the Facility)
- b) take care for the safety of all persons entitled to be on the site,
- c) use reasonable efforts to keep the Project Site and Work clear from unnecessary obstruction so as to avoid danger to these persons,
- d) Provide fencing, lighting, guarding and watching of the Work until completion, and
- e) Provide any temporary work (including roadway, footways, guards and fences, sheds) which may be necessary, because of the execution of the Work, for the use and protection of the public and of Owners and occupiers of adjacent lands.

11.6. OGDCL/ Consultant Not Liable for Information/Data

The PC Contractor shall bear sole responsibility for obtaining all information required by it to perform the Work in strict compliance with this Contract and shall rely on the same at its own exclusive responsibility and risk. OGDCL/Consultant shall provide to the PC Contractor information and design engineering data of equipment and packages required by the PC Contractor in order to ensure performance of the Work in strict accordance with the

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requirements of this Contract. The PC Contractor shall consider and check information and design engineering data received from OGDCL/ Consultant at its own cost.

11.7. **Quality Assurance**

The PC Contractor shall institute a quality assurance and document control system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. OGDCL shall be entitled to audit any aspect of the system.

Details of all procedures and compliance documents shall be submitted to OGDCL Representative for information before each execution stage is commenced. When any document of a technical nature is issued to OGDCL, evidence of the prior review, check and approval by the PC Contractor himself shall be apparent on the document itself.

Compliance with the quality assurance system shall not relieve the PC Contractor of any of his duties, obligations, or responsibilities under the Contract.



11.8. **Unforeseeable Difficulties**

The PC Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances including the variation in price of material of construction, cost of living, labor cost, etc. which may influence or affect the Work. By signing the Contract, the PC Contractor accepts responsibility for having foreseen all difficulties and cost for successfully completing the Work. The Contract Price shall not be adjusted to take account of any unforeseen difficulties or cost, except as otherwise stated in the Contract.

11.9. **Protection of the Environment and Wildlife & Responsibility**

The PC Contractor shall take all reasonable steps to protect the environment (both on and off the Project Site) and to limit damage, the nuisance to people and property resulting from pollution, noise and other results of his operations. Damage to any property and environment shall be restored by the PC Contractor at its own cost.



The PC Contractor shall ensure that emissions, surface discharges and effluent from the PC Contractor's activities shall not exceed the permissible values prescribed by applicable laws.

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The PC Contractor or its Sub-Contractor shall not adopt any method for Work or camps living which may be damaging to environment or wildlife. The PC Contractor/Sub- Contractor shall not violate any law which may be in force for the protection of environment and wild life. Work in any protected zone shall be planned and executed in accordance with the requirement of the concerned department. Work shall be planned and executed to avoid any damage to any archeological or historical site in the vicinity of the Project Site, PC Contractor shall take necessary precautions to protect its workers from indulging, in shooting, hunting, cutting of trees or any other activity which may be against the law or damaging to environment or wildlife.

The PC Contractor agrees to inform himself and his Sub-Contractor of environmental protection laws, orders and regulations and to make all his employees and the Sub-Contractor fully cognizant of their responsibilities thereunder. The PC Contractor agreed that all Work shall be completed in a manner which complies with Federal and Provincial or Local Governments environmental and wildlife laws, regulations, procedures, etc. PC Contractor shall clean-up and remove any pollutant resulting from PC Contractor's non-compliance with the provisions of this Clause at his cost and expense; and if PC Contractor fails to do so, OGDCL may cleanup and remove the pollutant at PC Contractor's cost and expense. Without in any way limiting the generality of any other indemnity provisions contained in the Contract, PC Contractor agrees to indemnify and hold OGDCL harmless from and against all liability, loss, cost, damage and/or expense of every nature caused by, arising from, growing out of or incidental to any failure of PC Contractor to comply with the provisions of this Article.

- a) The PC Contractor shall be responsible for keeping unauthorized persons off the Project Site, and;
- b) Authorized persons shall be limited to the PC Contractor's Personnel, Sub-Contractor and OGDCL's Personnel and other personnel notified to the PC Contractor, by (or on behalf of) OGDCL as authorized personnel of OGDCL's other PC Contractors of the Project Site.
- c) The PC Contractor shall be solely responsible for the safety and security of Project Site until its handover to OGDCL on Completion of Project under the umbrella of OGDCL Security and safety system as the project site will be operational during the execution of the Project.
- d) Also, the security during transportation of equipment/material, man-power

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etc. required for the Project is also the responsibility of the PC Contractor.

11.10. **Contractor's Operations on Site**

The PC Contractor shall confine his operations to the Project Site, and to any additional areas, which may be obtained by the PC Contractor and agreed by OGDCL as working areas. The PC Contractor shall take all necessary precautions to keep Contractor's Equipment and PC Contractor's Personnel within the Project Site and these additional areas, and to keep them off adjacent land.

During the execution of the Project, the PC Contractor shall keep the Project Site free from all unnecessary obstruction, and shall store or dispose off any PC Contractor's Equipment or surplus materials. The PC Contractor shall clear away and remove from the Project Site any wreckage, rubbish and Temporary Work, which are no longer required. Removal of construction equipment from the Project Site shall, however, be with prior permission of OGDCL.

Upon completion of the Project, the PC Contractor shall clear away and remove all PC Contractor's equipment, surplus material, wreckage, rubbish and Temporary Work. All surplus and packing materials shall be handed over to OGDCL and shifted by the PC Contractor, at place(s) designated by OGDCL. The PC Contractor shall leave the Project Site and the Work in a clean and safe condition. Except that the PC Contractor may retain at Project Site, such Goods as are required for the PC Contractor to fulfill obligations under the Contract.



11.11. **Fossils**

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Project Site shall be promptly notified to OGDCL and placed under their care and custody. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

12.0 WORK PERMIT

The PC Contractor shall not perform any Work inside Plant area without consent of OGDCL. Such consent shall be evidenced by the issuance of a permit by OGDCL to the PC Contractor (hereinafter referred to as the "Work Permit").

In the event that work permit cannot be given due to operational reasons, the work shall be re-scheduled. The PC Contractor will accordingly undertake the required work.

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13.0 SAFETY & SECURITY REQUIREMENTS:

- 13.1. The PC Contractor shall make himself familiar with any code regulating safety, which may be applicable in his performance of the Works.
- 13.2. The PC Contractor shall observe all OGDCL's safety regulations and obtain safety permits for his Works at Project Site from OGDCL. The PC Contractor shall meet all the requirements and precautions as stipulated in the said permits.
- 13.3. The PC Contractor shall obtain entry passes for each of its staff member/worker required to work at Project Site. The PC Contractor shall ensure that its staff & workers remain confined to the working area. If PC Contractor's staff & workers are required to enter the Maru-Reti Gas Plant the same shall be done after obtaining express permission from OGDCL. The entry pass shall be issued to personnel carrying original CNIC.
- 13.4. The PC Contractor shall be solely responsible for the safety of the men and material during the execution of the project. PC Contractor shall plan and execute all activities in a very safe manner.



13.5. Operational Area:

Contractor will be responsible for their operational area Security in the Plant and will ensure following:

- i. Contractor will establish own camp area outside Maru-Reti Plant area which should be fenced and should have a gate.
- ii. Operational area shall be installed with CCTV cameras with at-least 15 days back-up recording.
- iii. Operational area shall have guards for safety of men and material to avoid any theft incident.

13.6. Employees Camp



- i. Contractor employees shall not be allowed to stay in OGDCL camp they will stay in their own camp set-up at their own cost
- ii. Guards shall be deployed at camp area to avoid any theft etc.
- iii. PC contractor shall arrange the security to and from Maru-Reti plant for the movement of their staff/ material/ equipment of the project as well as required for the execution of project.

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- iv. Barren land for Contractor's camp will not be provided by OGDCL. All such arrangements shall be made by the PC Contractor on its own expense.

13.7. Expatriates NOC/ Movement

- i. Provision of NOC for expatriates from all concerned offices, intimation to District Police Officers / Police Stations will be responsibility of the Contractor, however OGDCL Security Department will provide letter for DGPC.
- ii. Expatriates are to travel till Sukkur Airport from there on contractor will be responsible to move the expatriates on bullet proof vehicle with escort of 2xvehicles (each vehicle comprising of 5x armed guards).
- iii. Authorize persons shall be limited to the contractor's personnel, Sub-contractor and OGDCL's/ Engineering Consultant personnel and other personnel notified to the contractor by (or on behalf of) OGDCL/Engineering Consultant as authorized personnel of OGDCL/ Engineering Consultant's other contractors of the project site.
- iv. The Contractor shall be responsible for keeping un-authorized persons off the project site.
- v. The Contractor shall be solely responsible for the safety and security of Project Site until its handover to OGDCL on Completion of Project.
- vi. In case of any security issues, the Contractor shall keep OGDCL/Engineering Consultant informed through OGDCL Security Incharge at all times.
- vii. The Contractor shall be solely responsible for the security of during movement of its Employees & at site while OGDCL will only facilitate in case any assistance required
- viii. Contractor is responsible to provide list of their employees to OGDCL to get Entry cards from OGDCL Security Incharge of the location, to facilitate their entry.

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14.0 WORKING HOURS / DAYS

14.1. All works shall be carried out between in normal working hours 0800 hours to 1800 hours on all working days from Monday to Sunday. On gazetted holidays, no permanent work shall be carried out unless a written permission is obtained from OGDCL/Engineering Consultant. Similarly, for working beyond normal working hours a written permission will be necessary. No compensation will however be given to the PC Contractor for work on gazette holidays and any work beyond daily normal working hours as specified above. Execution of the project within the specified project timeline is the sole responsibility of the PC Contractor

15.0 COMPLETION TIME

15.1. The timely completion of the Works by the PC Contractor shall be the essence of the Contract, as OGDCL has to meet its obligations for completion of the Project. Since the execution of the project shall require to be performed in phases, accordingly, the Project i.e. Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project shall be completed as per following schedule:

- a) The total duration for the completion of Maru-Reti Compression Project shall be Five (05) Months (04 months for Mechanical completion & 01 month for Pre-commissioning/commissioning). (This includes all weekends, public holidays and the like, PC Contractor shall be responsible to plan all activities and manage the progress accordingly, while taking into account the restrictions of Pandemic/Epidemic lockdowns and the like of which may cause delay in the project completion).
- b) Mobilization within two (02) weeks from the date of establishment of L/C for supply while procurement (supply) of sufficient material to kick-start and maintain sufficient work-fronts for the project within two (02) weeks from the date of establishment of L/C for supply.
- c) Supply & delivery of all material required for the completion of the Maru-Reti Compression Project within 02 months from the date of establishment of L/C for supply.

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- d) Completion of all Mechanical, civil, electrical and instrumentation works along with erection/installation of equipment/packages/loose items supplied by OGDCL, to meet the requirements of Mechanical Completion certificate within Four (04) months from the date of establishment of L/C for supply.
- e) One (01) Month for the, Commissioning & Start-up assistance of the Reciprocating-Compressor, the Commissioning & start-up of separator packages and complete civil, electrical, mechanical works shall also be completed within this time period.

Note: The conditions of Liquidated Damages shall apply after four (04) months, the date of establishment of Supply L/C, in accordance with the Clause 28.0 of the Section-V, Conditions of Contract provided in Volume-I of the Tender Document herein. The Total duration of the Mechanical completion shall be (Four (04) months from the date of establishment of L/C for supply) as well as total duration of the Completion of Maru-Reti Compression Project (Five (05) Months). The PC Contractor shall be responsible to expedite/perform the works in such a manner as not to affect the project timeline. Any delay in the completion of Maru-Reti Compression Project shall be on the account of PC Contractor.



The PC Contractor shall perform procurement activities immediately after signing of the Contract and shall mobilize at Project Site and commence the work within fourteen (14) days period after the receipt of a written order to this effect from OGDCL.

16.0 MOBILIZATION/COMMENCEMENT OF WORK

The Contractor shall mobilize at Project Site and commence the work within the required period (i.e. 14 Days) after the date of establishment of L/C for supply and shall proceed with the same with due expedition and without delay. However, for procurement of Bulk piping, electrical and instrumentation material, Contractor shall start procurement after the date of establishment of L/C for supply, and approval of BOQs from OGDCL. OGDCL shall also provide the PC Contractor Issued for Construction (IFC) Drawings and corresponding BOQs based on the information available at that time after the signing of the Contract and after the receipt by him of a written order for mobilization to site from OGDCL.

17.0 PROGRESS REPORTING

17.1. At fifteen (15) days intervals during the performance of Contract the Contractor shall submit progress report four (04) copies to OGDCL. The reports shall show clearly and accurately the position of all activities associated with procurement (supply), construction, pre-commissioning, commissioning and start-up services (including performance testing) of the Project and the apart Project Execution Schedule. The progress reports shall be set out in a format approved by OGDCL.

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- 17.2. The progress report shall indicate each item of progress of Work giving the percentage completion and expected completion date vis-à-vis agreed project execution schedule.
- 17.3. A delay due to any reason which may affect the completion, commissioning and testing dates of any item of work shall be reported by the Contractor to OGDCL/Engineering Consultant. The report shall state the action being taken to adhere to agreed project schedule.
- 17.4. The Contractor's Site Office shall prepare and submit to OGDCL three (3) copies of Daily Activity Report summarizing the main activities undertaken and completed each day such as welding, piping, hydrostatic tests, etc.

18.0 RATE OF PROGRESS



If for any reason, the rate of progress of the Works or any section is at any time, in the opinion of OGDCL, too slow to ensure completion by the prescribed time or extended time for completion, OGDCL shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary to expedite progress so as to complete the Project or such section by the prescribed time or extended time, if agreed to by OGDCL.

19.0 OGDCL/ CONSULTANT ACCESS TO THE WORK

- 19.1. OGDCL's/ Consultant's representatives and any person(s) so authorized by them shall at all times have access to the Work and to the all workshops, and places where work is being performed at PC Contractor's office Fabrication, manufacturing and project site where work is being performed.
- 19.2. No Work shall be covered up or put out of view without prior approval of OGDCL's representatives and the PC Contractor shall afford full opportunity for OGDCL's/Consultant's representatives to examine, measure and test any work, which is going to be covered up or put out of view. The Contractor shall give notice to OGDCL, which shall be reasonably in advance and OGDCL without unreasonable delay examine, measure and inspect such Work.
- 19.3. The PC Contractor to arrange proper and safe access for the OGDCL/Consultant staff, in a manner that all Work can be inspected at any time until permission for its cover up backfill has been given by the concerned OGDCL.

20.0 DETAILED PROJECT EXECUTION/SCHEDULE

- 20.1. The PC Contractor shall, within fourteen (14) days of the notification with the intent to award the Contract, submit to OGDCL for their approval Detailed Supply/Work

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Programme /Schedule showing the sequence/order of activities procedures and methods in which he proposes to fulfill his obligations under the Contract within the stipulated completion time. The Execution/Schedule shall be comprehensive and shall show break-up of principal elements and major items of Supply/Works, the date upon which procurement (supply) of equipment/materials, each type of installation, construction, fabrication, pre-commissioning, commissioning and start-up works is scheduled including performance testing, schedule to begin and complete. Full particulars of the organization staff by which the PC Contractor proposes to direct and administer for due and faithful performance of the Contract shall also be furnished along with the Detailed Project Execution /Schedule.



- 20.2. The PC Contractor shall whenever required, by OGDCL, or their representatives, also provide in writing approach, methods plans, which the Contractor proposes to adopt for execution of various components of Work.
- 20.3. If at any time it should appear to OGDCL that the actual progress of the Works does not conform to the approved Project Execution/schedule, the PC Contractor shall produce, at the request of OGDCL, the PC Contractor shall apprise OGDCL for such nonconformance of the approved Project Execution/schedule and if agreed by OGDCL, the PC Contractor shall provide a revised Project Execution /schedule showing the modifications to the approved Project Execution / schedule necessary to ensure completion of the Project within the stipulated completion time.
- 20.4. The submission to and approval by OGDCL of such schedules or the furnishing of such particulars shall not relieve the PC Contractor of any of his duties or responsibilities under the Contract.

21.0 COMPLIANCE WITH STATUTES, REGULATIONS, ETC.

- 21.1. The PC Contractor shall conform in all respects with the provisions of any and all applicable laws, regulations, by-laws, rulings and orders which may be applicable to the Work and with such rules and regulations of public bodies and companies as aforesaid and shall keep the OGDCL indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or by-law.

22.0 PERFORMANCE BOND (BANK GUARANTEE)

- 22.1. Within fifteen (15) days of the receipt of notification of intent to award the Contract from OGDCL, the PC Contractor shall furnish a Performance Bond in the Form of Bank Guarantee for an amount of ten percent (10%) of the Contract Price as a guarantee for the due and faithful performance of the Contract The said Performance



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Bond shall only be issued by banks listed in **Appendix-K** and acceptable to OGDCL, and be valid up to twelve (12) months from the date of the Provisional Acceptance Certificate.

- 22.2. The proceeds of the Performance Bond/Guarantee shall be payable to OGDCL as compensation for any loss resulting from the PC Contractor's failure to fulfill its obligations under the Contract.
- 22.3. As a guarantee for the faithful performance of the obligations under the Contract, the PC Contractor shall establish such Guarantee in favor of OGDCL as per Contract Documents.
- 22.4. The said Guarantee shall be in accordance with format given in **Appendix-K** and the cost of this guarantee shall be at the expense in all respect of the PC Contractor.
- 22.5. No claim shall be entertained against the OGDCL on account of interest on security deposits in lieu of performance bank guarantee.
- 22.6. The Performance Bond shall be released to the PC Contractor after one (01) month from the date of issuance of Acceptance Certificate, provided that the PC Contractor has performed his obligations, liabilities, responsibilities arising under and in pursuance of the Conditions of Contract, to the entire satisfaction of OGDCL. If PC Contractor is unable to meet its obligations the Performance Bond will be extended or encashed as per OGDCL's discretion.

23.0 CONTRACT PRICE

The Contract shall be for Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning and Commissioning of complete Civil, Electrical, Mechanical and integration Works as well as construction, installation/erection, assembly, Pre-commissioning; commissioning & Start-up assistance of New Reciprocating Compressor package, required for the integration of the packages with the Existing facility for completion of Maru-Reti Compression Project as per requirements stipulated in the tender document and meeting the technical specifications, applicable standards and OGDCL's objectives and requirements. The Contract shall be on item-wise price/unit rate basis. The total Contract price shall be an estimated amount in Pak Rupees subject to variation on account of changes in quantities of items given in BOQs and for additional work (if any). The item-wise price/unit rate shall include but not limited to shipment cost, inland transportation to site, within plant transportation, loading/unloading, insurance, duties, sales and other taxes, levies etc. and shall remain fixed during the performance of the Contract. The item-wise price/unit rate shall not be subject to escalation throughout the duration of the

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contract period regardless of any circumstance whatsoever even unforeseen at present.

The price for additional equipment/material supplied and work (for items not covered in BOQ/price schedule as well as in rates for additional work) carried out shall be paid to Contractor by OGDCL as per actual price/rate plus service charges @ five (05) percent of Site Cost. OGDCL shall have the right to ask the PC Contractor to submit three (03) (technical & commercial) quotations. OGDCL shall also have the right to advise the PC Contractor to purchase the required item from the Vendors/Suppliers whose quotations have been submitted or from other suitable Vendor/ Supplier.

The PC Contractor shall be paid on item-wise price/unit rate basis as per BOQs/Price Schedule and actual quantities verified by OGDCL. Any wastage shall be on PC Contractor's account and no compensation shall be payable to the PC Contractor against any wastage.

The prices of equipment and material imported in finished form shall be inclusive of all taxes including insurance, custom duties, levies, port clearance/freight charges up to site (both local/foreign material), sales/income tax etc. as applicable in Pakistan The custom duty is levied at a concessional rate as applicable on imports of equipment & material by E&P companies under SRO 678 (I)/2004/any other relevant SROs. OGDCL shall only provide facilitation letters to the Contractor in obtaining required duty concessions as per SRO. 678 (I)/2004/any other relevant SROs. However, obtaining such concessions and custom clearance shall be sole responsibility of the PC Contractor. Any additional duty or taxes is also sole responsibility of the PC contractor. If any CGO item/material is imported by the PC contractor then all the additional duties, taxes, guarantees and any other requirement shall be sole responsibility of the PC Contractor. Further transportation to site for both local and foreign material is also the responsibility of the PC contractor.

Any tax deduction shall be made as per prevailing laws/regulations.



24.0 PAYMENT TERMS

All payments shall be made to lead partner under JV arrangement (if applicable)

24.1. Local/Foreign Supply of Equipment & Material Items

All supply payments shall be paid in Pak Rupees through inland letter of credit:



- Ten (10%) percent of supply contract price shall be made as advance payment after submission and authentication of advance bank guarantee (only from banks listed in **Appendix-K**) for an equivalent amount as per format given in **Appendix - J** and after submission of Performance Bond (Guarantee) as per format given in **Appendix-K**

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- Seventy (70%) percent payment shall be paid on satisfactory shop inspection of equipment & material (where applicable) and after delivery / inspection of equipment & material at Project Site on submission of following documents:
 - Original Commercial Invoice showing material description quantity unit and total price duly verified by OGDCL showing:
 - Complete, first and last shipment payment (if all material is shipped in one lot).
 - First partial shipment/second partial shipment (and so on) Final and last shipment as the case may be if shipments are effected in parts
 - All invoices should be signed and must indicate value of each item total value provided in the contract
 - Original GST Invoice
 - Clean Truck /Carrier receipt showing freight pre-paid
 - Packing List showing Weight in Kilograms (Gross/Net).
 - Technical Catalogue / literature copy (where applicable)
 - Certificate the goods are brand new and conform to the contract specification
 - Copy of NTN certificate
 - Sales Tax Payment proof (Annexure-C) issued by FBR
 - Copy of valid tax exemption certificate in case of exemption granted by FBR (if applicable)
 - Copy of valid Professional Tax Paid /Clearance Certificate
 - Mill inspections /Quality certificates (where applicable)
 - Warranty Certificate
 - Certificate of origin
 - Duly signed and stamped delivery note
 - Certificate issued by beneficiary that packing of the material conform to the International Standards and all packages/boxes bear the Purchase Order No. and Weight in Kilograms (Gross/Net).

- Ten (10%) percent payment shall be made after thirty (30) days of issuance of completion certificate on submission of contractor’s invoice duly verified by OGDCL and copy of completion certificate.

- Ten (10%) percent payment shall be made after thirty (30) days of issuance of acceptance certificate on submission of contractor’s invoice duly verified by OGDCL and copy of acceptance certificate.



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Note: Payments against all of the above milestones shall be cleared/released upon submission of Annexure-C duly issued by FBR or any relevant provincial tax authority.

24.2. Services payment:

All services payment shall be paid in Pak Rupees through Inland Letter of Credit or account payee cheque:

- Construction, fabrication, Installation/Erection & Pre-commissioning:
 - Ten (10%) percent of supply contract price shall be made as advance payment after submission and authentication of advance bank guarantee (only from banks listed in Appendix-K) for an equivalent amount as per format given in **Appendix - J** and after submission of Performance Bond (Guarantee) as per format given in **Appendix-K**
 - Sixty (60%) percent payment shall be made by OGDCL as progressive payments to Contractor on monthly basis against Contractor's invoices giving details of specific work and its completion status. The payment shall be made considering the Bid Price Schedule of Works and verified percentage completion of work. The measurement/verification mechanism for progressive payments of Works is detailed in Appendix-L. The measurement/verification of Works will be made by OGDCL/Consultant based on progress reports submitted by the Contractor and actual progress at site.
 - Ten (10%) percent payment shall be made after thirty (30) days of issuance of completion certificate (which shall only be issued after successful commissioning and Start-up of the complete Compressor package along with the modification/integration works required for the completion of the Maru-Reti compression Project) and on submission of contractor's invoice duly verified by OGDCL and copy of completion certificate.
 - Ten (10%) percent payment shall be made after completion of punch list, submission of material reconciliation and As-built drawings.

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- Ten (10%) percent payment shall be made after thirty (30) days of issuance of acceptance certificate on submission of contractor's invoice duly verified by OGDCL and copy acceptance certificate.

Note: Payments against all of the above milestones shall be cleared / released upon submission of Annexure-C duly issued by FBR.

25.0 INSPECTION OF SITE



- 25.1. The PC Contractor shall also be deemed to have inspected and examined the Project Site and its surrounding areas and information available in connection therewith and to have satisfied himself, before submitting his Tender, as to the form and nature thereof, the extent and nature of work and materials necessary for the completion of the work, the means of access to the Site and in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender.
- 25.2. Any neglect or failure on the part of the PC Contractor in obtaining the necessary information mentioned in Sub-Article 16.1 of this Article hereinabove or any other matter affecting the Contract, shall not relieve the PC Contractor from any risks or liabilities or from the responsibility for the completion of the Project in strict accordance with the Contract Documents. In no case will OGDCL/Consultant assume responsibility nor any liability of any kind what so ever for lack of any such information as is mentioned in Sub-Article 25.1 of this hereof.

26.0 WORK TO THE SATISFACTION OF OGDCL

- 26.1. The PC Contractor shall execute and maintain the work in strict accordance with the contract to the satisfaction of OGDCL and shall comply with and adhere strictly to OGDCL instructions and directions on any matter whether mentioned in the contract or not, touching or concerning the Work. The PC contractor shall take instructions and directions from OGDCL.



27.0 TAXES

- 27.1. All taxes on the income or payments to the contractor arising, accruing or resulting under the contract, whether present or future, assessed or payable inside or outside Pakistan shall be the exclusive responsibility of the contractor or its Sub-contractor(s). Company, in order to discharge its responsibilities as withholding agent shall withhold income tax from the

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payments to the contractor within the contract value at the rates applicable at the time of payments.

- 27.2. Sales tax on goods as well as services is applicable in Pakistan under federal/provincial sales tax laws. The contractor being registered with respective federal/provincial revenue authority of Pakistan is entitled to charge applicable sales tax over and above its bid price and will be responsible for the payment of such sales tax to the respective revenue authority as per the prevailing federal/provincial sales tax laws. OGDCL being the withholding agent shall withhold sales tax from the contractor (whether registered or unregistered), as per respective sales tax withholding rules. Any indirect tax including value added tax, sales tax etc. present or future, applicable outside Pakistan shall be exclusive responsibility of the Contractor. (Sales tax on Goods and Services to be quoted as separate line item).
- 27.3. The Contractor shall be responsible for income tax and all other taxes levied on the Contractor's and its Sub-contractor's expatriate personnel, their social security obligations and contributions regardless of whether such contributions are levied on employer or employee or both in Pakistan or outside Pakistan
- 27.4. The Contractor shall keep OGDCL informed of the steps taken by it to discharge the tax obligations under the Contract and provide supporting documents whenever required by the OGDCL.
- 27.5. The Contractor shall indemnify OGDCL against any claim which might occur due to non-compliance by Contractor of any legal obligation regarding taxes, duties, fees, levies, or other charges, including taxes on income and sales tax in Pakistan and any other payments due to the Federal or Provincial Governments, their agencies or any other relevant authority.
- 27.6. All clearing and brokerage charges incurred shall be to the account of PC Contractor
- 27.7. PC Contractor agrees not to sell, transfer or dispose any of its machinery, equipment, spare parts or material imported under this contract within the country without prior written approval from OGDCL and without payment of taxes (including custom duties etc.) due to the Government.
- 27.8. PC Contractor is responsible to settle all OGDCL obligations or guarantees with the customs authorities and to clear OGDCL of all such

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responsibilities.

27.9. PC Contractor is responsible to obtain all customs approvals and other documentations. OGDCL will endeavor to assist PC Contractor in obtaining such approvals and documentation.

27.10. The above clauses relating to payment of taxes would prevail notwithstanding a contrary expression reflected in any other clause of the contract.

28.0 LIQUIDATED DAMAGES

- a. If the PC Contractor fails to complete the Procurement (Supply) of Bulk piping, Electrical & instrumentation material, Construction, Fabrication, Installation/Erection, hook-up, Pre-Commissioning of the complete Civil, Electrical, Mechanical and integration Works related to all equipment/package/ loose items/skids for the completion of the Maru-Reti Compression Project, in accordance with the requirements of acquiring the Mechanical Acceptance certificate, within the time period of Four (04) months from the date of establishment of Supply L/C, then Company shall, without prejudice to other remedies under the contract, deduct from the contract price / Bank Guarantee as liquidated damages, a sum not more than 0.5% of the contract price per week or part thereof for first four weeks, 1.00% per week for next four weeks and 1.5% per week exceeding four weeks up to maximum extent of 10 % of the contract value.
- b. In case the Company is satisfied that the delayed / defective shipment/ works was due to some mistake or circumstances beyond the control of the contractor and the contractor has not intentionally or negligently contributed in the delay, the Company may impose Liquidated Damages for not more than a sum equivalent to 0.5% of the delayed or defective shipment/ services per week or part thereof for first two weeks, 1.00 % per week for next three weeks and 1.5% per week exceeding five weeks but not exceeding 10% of the contract value of the delayed/ defective shipment/ services provided that the contractor takes immediate remedial measures for the-replacement of defective shipment and takes prompt steps to mitigate the delay. The Company may however, impose Liquidated Damages as per (a) above if the delayed or defective shipment/ services has affected the project completion schedule or has resulted in production losses.
- c. Even after imposition of LDs, if the Contractor fails to materialize the delivery (material and or services); the Company reserves the right to cancel Purchase order/Contract/LC and to forfeit the Guarantee (if applicable) after intimating the supplier for such cancellation / forfeiture.

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29.0 NOT APPLICABLE

30.0 NOT APPLICABLE

31.0 QUANTITIES

The quantities set out in the Bill of Quantities (BOQs) are the estimated quantities of the work, and are not to be taken as the actual and correct quantities of the works to be executed by the PC contractor in fulfillment of his obligations under the contract.

32.0 CARE OF EXISTING FACILITIES AND FINISHED WORKS

32.1. The PC contractor shall at all times during the performance of the works be fully responsible for the care of the existing facilities.

32.2. The PC contractor shall effectively protect finished / temporary works from action of weather and from injury or defacement, and shall cover finished parts where required for their thorough protection. Finished work shall be left perfectly clean and free from defects.

33.0 QUALITY OF MATERIALS & WORKMANSHIP AND TESTS

All equipment/materials and workmanship by the PC Contractor shall be of the respective kinds described in the Contract and in accordance with OGDCL's instructions and shall be subject from time to time to such tests as OGDCL may direct at the place of manufacture or fabrication, or at Project Site or at such other place or places as may be specified in the Contract, or at all or any of such places.



The cost of all such tests shall be on PC contractor's account and no compensation whatsoever shall be given to the PC contractor.

34.0 WARRANTIES

34.1. The PC Contractor further warrants that the required equipment/material supplied under the Contract shall be:

- a) Brand new, of good quality, free from all defects and having good title and for the use intended
- b) Conforms in all respect with the specifications and requirements given in the Contract.

34.2. PC Contractor warrants that the installation, erection and other Works shall be of good quality, free from faults or defects and shall perform so as to comply with the specifications contained in the contract documents or with



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any revisions thereof pursuant to any changes. PC Contractor further warrants that all work performed under the Contract shall be in accordance with industry's recognized codes and standards.

- 34.3. The foregoing warranties shall remain valid for a period of one (01) month from the date of Certificate of Completion set forth in clause 45.2.
- 34.4. If the supplied equipment & material installation/erection and related works fail to meet the warranty conditions set. OGDCL shall promptly notify the PC Contractor in writing about the defects and claims under the warranty. Upon receipt of such notice the PC Contractor shall within the time specified by OGDCL repair/replace the defective equipment, material and or portion of works, with no cost or expense to OGDCL.
- 34.5. If the PC Contractor having been notified, fails to remedy the defect(s) within the specified time, OGDCL shall proceed to take remedial actions as may be necessary, at the PC Contractor's risk and cost. All costs thereof shall be charged to the PC Contractor or recovered from retention money/performance bond. The PC Contractor shall have no objection to the above and he hereby acknowledges the rights of OGDCL to recover such sums as a debt due to OGDCL from defaulting PC Contractor. It is understood that in this case the PC Contractor shall not be relieved from the provided warranties and contractual obligations.
- 34.6. The supplier shall also provide warranties of original manufacturers where applicable.

35.0 DELAYS IN THE PC CONTRACTOR'S PERFORMANCE

- 35.1. Completion of required installation, pre-commissioning, and commissioning assistance shall be made by the PC Contractor in accordance with the stipulated completion time specified in **Appendix-A** of the Contract.
- 35.2. An unexcused delay by the PC Contractor in performance of the Contract including delivery of equipment/material being supplied and timely completion of the Project shall render the PC Contractor liable to any or all of the following sanctions:
- Forfeiture of its performance bond (bank guarantee)
 - Imposition of liquidated damages
 - Termination of contract for default
 - Any other remedies available and action to be taken by OGDCL as per the

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terms of this Contract and applicable law.

36.0 DEFAULT OF PC CONTRACTOR IN COMPLIANCE

In case of default on the part of the PC Contractor in carrying out such order, OGDCL shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the PC Contractor by OGDCL, or may be deducted by OGDCL from any monies due or which may become due to the PC Contractor or by en-cashing performance bond.

37.0 DAMAGE TO PERSONS AND PROPERTY

The PC Contractor shall, indemnify OGDCL against all losses and claims in respect of injuries or damage to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution of the Work under the Contract and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto.

The PC Contractor shall indemnify OGDCL against all losses, claims and demand made by any third party/persons arising out in performance of its obligations under this Contract whether such claims, demands and actions are made while this Contract is in force or at any time after its execution or termination.



The PC Contractor shall be responsible for similar indemnify for any Sub-contractors performing work under this direction.

38.0 ACCIDENT OR INJURY TO WORKMEN

The PC Contractor shall indemnify and nor OGDCL shall be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the PC Contractor or any Sub-Contractor. The PC Contractor shall indemnify and keep indemnified OGDCL against all such damages and compensation, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

39.0 ENGAGEMENT OF LABOR

The PC Contractor shall make his own arrangements for the engagement of all labor, transport, meals, etc., and payment thereof.

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40.0 FESTIVALS & RELIGIOUS CUSTOMS

The PC Contractor shall in all dealings with labor in his employment have due regard to all recognized festivals, days of rest and religious or other customs.

41.0 DISORDERLY CONDUCT, ETC.

The PC Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection of persons and property in the neighborhood of the Work against the same.

42.0 REMOVAL OF IMPROPER WORK & MATERIALS

OGDCL shall during the progress of the Work have power to order in writing from time to time:

- a) The removal from the Project Site, within such time or times as may be specified in the order, of any materials which, in the opinion of OGDCL, are not in accordance with the Contract
- b) The substitution of proper and suitable materials and
- c) The removal and proper re-execution of any work which in respect of materials or workmanship is not, in the opinion of OGDCL, in accordance with the Contract.



43.0 REMOVAL OF CONSTRUCTIONAL EQUIPMENT, ETC.

Upon completion of the Works the PC Contractor shall remove from the Site all the said Constructional Plant and Temporary Work remaining thereon and any unused materials provided by the Contractor.

OGDCL shall not at any time liable for the loss or damage to any of the said construction plant and temporary works or materials.

44.0 CLEARANCE OF SITE ON COMPLETION

On the completion of the Project the PC Contractor shall clear away and remove from the Site all Constructional Plant, surplus materials, equipment, rubbish and Temporary Work of every kind, and leave the whole of the Site and Work clean and in a workman like condition at its own cost.

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45.0 ACCEPTANCE CERTIFICATES

45.1. Mechanical Acceptance Certificate

When whole of the Work have been completed mechanically & have satisfactorily passed the mechanical, electrical, instrumentation completion, inspection & testing, pre-commissioning requirements and mechanical acceptance as that prescribed in relevant clause of the conditions of the contract, the PC Contractor may request OGDCL to issue mechanical acceptance certificate. The format of Mechanical Acceptance Certificate is enclosed in **Attachment-I**.

45.2. Certificate of Completion

When all the modification/integration works have been completed/commissioned, the complete Compressor package has been successfully commissioned as well as successful start-up of the Compressor package has taken place and construction equipment (if any) has been removed as per Article 44.0 of the Conditions of Contract, the PC Contractor may request OGDCL to issue the Certificate of Completion. The format of Certificate of Completion is enclosed in **Attachment-II**.

45.3. Acceptance Certificate



Subject to article 34.0 when the equipment and packages has remained in operation for One (01) months from the date of Certificate of Completion the PC Contractor may request OGDCL to issue Acceptance Certificate. The format of Acceptance Certificate is enclosed in **Attachment-III**.

46.0 WITHHOLDING PAYMENT

46.1. OGDCL may withhold the whole or part of any payment claimed by the PC Contractor, which in the opinion of OGDCL is necessary to protect himself from loss on account of:

- i. Defective equipment and material not replaced/repaired or remedied.
- ii. Warranties/Guarantees not met.
- iii. Claims filed against PC Contractor.
- iv. Failure of PC Contractor to make payments due for materials or labor employed by him.
- v. Damages to other Contractor (if any).
- vi. PC Contractor's non-compliance with the provisions of the Contract.

46.2. When the conditions for withholding the payment are removed, payments of the amount due to the PC Contractor will be made by OGDCL without delay.

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47.0 FINAL PAYMENT DOCUMENTS

The Contractor shall execute and deliver to OGDCL the following documents before release of performance bank guarantee:

- a) Certificate of Completion
- b) Final acceptance Certificate
- c) Certificate of Compliance
- d) Undertaking



Blank Forms of these are given in **Attachment-II, III, IV and V** respectively.

48.0 LIENS

The PC Contractor for himself and for any persons directly or indirectly responsible to him, and for his or their material equipment and employees, and for all other persons performing any labor or furnishing any labor or materials for any of the work covered by his contracts, will be required to release or waive, to the full extent permitted by law, all liens, for or on account of the work done or equipment and materials furnished hereunder, and the improvement or structures wherein some may be incorporated, and the land to which they are appurtenant shall at all times and clear of all such liens.

49.0 SUSPENSION OF WORK

- 49.1. PC Contractor shall, on the written order of OGDCL, suspend the progress of the procurement (supply), construction and commissioning assistance works or any part thereof for such time or times and in such manner as OGDCL may consider necessary and shall during such suspension properly protect and secure the Works, so far as is necessary in the opinion of OGDCL.
- 49.2. PC Contractor shall not be entitled for any extra cost for such suspension up to a maximum period of sixty (60) days. This period may be in one or more suspensions.
- 49.3. In case the suspension period exceeds Sixty (60) days, then the PC Contractor may claim, if he gives notice in writing of his intention to OGDCL within seven (7) days of expiry of sixty (60) days suspension period. The PC Contractor can claim the cost of his permanent employees and hired equipment only employed on the Project Site. OGDCL will verify the claims for payments to be made to the PC Contractor in this respect.

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50.0 TERMINATION OF DEFAULT



50.1. OGDCL shall have the right to terminate the Contract if the PC Contractor.

- a) Does not mobilize and/or commence execution of the Contract/Order within the agreed date(s).
- b) Stops work during the execution of the Contract/Order.
- c) Fails to supply sufficient and/or adequate construction equipment, temporary works, labor, materials or satisfactory performance and delays in the progress of work.
- d) Becomes bankrupt or insolvent.
- e) Has judiciary liquidation filled by/or against him, and the PC Contractor does not have the right to continue his industrial activities.
- f) Fails to fulfill any of his obligations as defined in the Contract Documents.

50.2. OGDCL shall have the right to notify deadline to be met by the PC Contractor. Should the PC Contractor not reply within 7 days to the above notification, or in case that the reply is not found satisfactory, OGDCL would be entitled to terminate this Contract. OGDCL shall then give notice of termination, and thereupon, OGDCL shall have the right to take over the performance of the Works, take possession of the engineering drawings and data and all materials and stocks located at the Site, and to complete the Works in any manner OGDCL deems fit, and to use of cause to be used for that purpose the temporary works and equipment of PC Contractor located at the Project Site.

50.3. In the event of such termination, after all works, services, deliveries, etc., effected by PC Contractor under this Contract have been stated and recorded, OGDCL will be titled to withhold any further payments due to PC Contractor under this Contract. At the time of termination, OGDCL and PC Contractor shall determine by mutual agreement the amount, if any, of damages suffered by OGDCL, and the amount to which PC Contractor is entitled for his performance of the work up to the date of such termination.

50.4. Termination of the Contract shall not relieve PC Contractor of any of its obligations to make repairs and replacements with respect to any workmanship, material, equipment, part or item incorporated in the Works



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prior to such termination, nor shall termination relieve PC Contractor of any its obligations under any other provision of the Contract with respect to the Works performed by PC Contractor prior to such termination.

- 50.5. The defaulting PC Contractor shall also be liable for all costs and expenses incurred, including those of cleaning the site and removal of PC Contractor's equipment and material if required by OGDCL, because of the default and, the PC Contractor shall fully indemnify OGDCL.

51.0 FORCE MAJEURE



- 51.1. In the event of either party hereto being rendered unable, wholly or in part, by Force Majeure Circumstances to carry out its obligations under the Contract Documents, then on such party giving notice and full particulars and other satisfactory evidence of such Force Majeure circumstance(s) relied upon the obligations of the party giving such notice so far as they are affected by such Force Majeure shall be suspended for the period during which the party, is rendered unable as aforesaid, but for no longer period, and such cause(s) shall, as far as possible, be remedied and obviated with all reasonable dispatch. The term 'Force Majeure' as employed therein, shall mean Acts of God or public enemy, civil insurrection, fires, floods earthquakes or other physical disasters, order or request of Government, blockade or embargo, acts of terrorism and mob attacks etc. It is, however, clarified that strikes, lockouts, shortage or non-availability of raw materials, rains disturbances, other labor disputes or congestion ports on the PC Contractors side shall not be included in the term 'Force Majeure'. During the period of established Force Majeure as contained herein above, neither PC Contractors would be entitled for payment nor OGDCL would impose penalty as required under this Contract.
- 51.2. In case the Force Majeure contingencies last continuously for more than fifteen days, both parties will agree on the necessary arrangements for the further implementation of the Contract. In case further implementation is unforeseeable and impossible, both parties shall arrange for the termination of the Contract, but without prejudice to their rights and obligations prior to such termination it being understood that each party shall fulfill their contractual obligations so far as they have fallen due before the operation of Force Majeure.
- 51.3. In case of Force Majeure no idle time claim will be paid by OGDCL to the PC Contractor for what so ever reason.

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52.0 ARBITRATION

- 52.1. If any dispute or difference of any kind whatsoever shall arise between OGDCL and the PC Contractor in connection with, or arising out of the Contract, or the execution of the works, whether during the progress of the works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall, in the first place, be referred to and settled by OGDCL who shall, give written notice of his decision to the PC Contractor. Subject to arbitration, as hereinafter provided, such decision in respect of every matter so referred shall be final and binding upon the PC Contractor and shall forthwith be given effect to by the PC Contractor, who shall proceed with the execution of the Works with all due diligence whether he requires arbitration, as hereinafter provided, or not. If OGDCL has given written notice of his decision to the PC Contractor and no claim to arbitration has been communicated to him by the PC Contractor within a period of thirty days from receipt of such notice, the said decision shall remain final and binding upon the PC Contractor. If OGDCL fails to give notice of his decision, as aforesaid, within a period of thirty days after being requested as aforesaid, or if the PC Contractor be dissatisfied with any such decision, then and in any such case or within thirty days after the expiration of the first-named period of thirty days, as the case may be require that the matter or matters in dispute be referred to arbitration as hereinafter provided.
- 52.2. All disputes or differences in respect of which the decision, if any, of OGDCL has not become final and binding as aforesaid shall be finally referred to two Arbitrators, one to be appointed by each party or in the event of the Arbitrators not agreeing to an umpire to be appointed by Arbitrators before entering upon the reference, who shall proceed to arbitrate in accordance with the provisions of the Pakistan Arbitration Act 1940 and rules hereunder any statutory amendment in that behalf for the time being in force and the award made by the Arbitrators or the umpire as the case be, shall be final and binding on both the parties Arbitration proceeding shall be conducted in the English Language.
- 52.3. PC Contractor shall continue to execute his work with full speed during the pending of the Arbitration proceedings. However, OGDCL shall have the power to order the PC Contractor in writing to stop the work in full or in part if considered necessary

53.0 JURISDICTION

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This Contract shall be construed, interpreted and governed by the laws of Islamic Republic of Pakistan. The Agreement and any interpretation and construction thereof including Arbitration proceedings shall be subject to and governed by the laws of Pakistan. The Court of competent authority in Pakistan have exclusive jurisdiction over the matter in question.

54.0 APPLICABLE LAW

- 54.1. This Contract or any amendment thereto shall be construed, interpreted and governed by the Laws of Islamic Republic of Pakistan.
- 54.2. Applicable laws mean all laws, treaties, regulations, standards, decrees, rules decisions, judgments, order, injunction, authorizations, directives, permits, licenses or authorizations applicable to the performance of the Works in accordance with the Contract and issued by or adopted by an Governmental Authority having jurisdiction over the matter in question and which are in effect at the time in question and, for the avoidance of doubt, includes compliance with the requirements of the Environmental Impact Assessment, environmental laws, regulations, codes, standards etc. and policies of the Federal Government, Provincial Governments and Local Bodies of Pakistan.

55.0 UTILITIES



The PC Contractor shall be responsible for arrangement and handling of all utilities for execution of project including electricity, Potable Water for construction use.

56.0 LIABILITIES

- 56.1. Each Party shall defend, indemnify and hold the other Party harmless from and against any claim arising out of (i) loss of or damage to its own property, and / or (ii) death of or injury to its own personnel.
- 56.2. Each Party shall be liable for, and shall defend, indemnify and hold the other Party and its members/affiliates, co-ventures (if any), contractors or Subcontractors, and its and their respective employees, directors, officers, agents and invitees harmless from and against all claims, demands, causes of action, judgements, awards, damages, losses, costs, expenses and liabilities of any kind and character arising out of third party property damage (including loss) or third party person injury (including death) caused by the indemnifying Party's negligence during the performance of the Contract.

57.0 INDEMNITIES

- 57.1. Neither Party shall be liable to the other for any punitive, indirect or



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consequential damages sustained by the other including without limitation business interruptions, loss of profits, loss of use of assets, loss of data and loss of contracts, and each Party shall hold the other Party harmless in respect thereof.

- 57.2. The PC Contractor shall indemnify the OGDCL against all motions, proceedings, claims, liens and demands whatsoever which may be made against the OGDCL by the third parties for or in respect of or out of any failure by the PC Contractor in performance of its obligation or wrongful performance under this Contract or any act or omission in connection therewith. Should OGDCL have to pay any moneys in respect of any such claims or demands, the amounts to be paid and the costs incurred by the OGDCL connection therewith, shall be charged in to and paid by the Contractor in full.

58.0 DECLARATION

- 58.1. The PC Contractor hereby declares that it has not obtained or induced the procurement of any Contract, right, interest, privilege or other obligation or benefit from OGDCL through any corrupt business practices.
- 58.2. Without limiting the generality of the foregoing, the PC Contractor represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, Contractor, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from the OGDCL, except that which has been expressly declared pursuant hereto.
- 58.3. The PC Contractor certifies that it has made and shall make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with the OGDCL and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.
- 58.4. The PC Contractor accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration,

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representation and warranty. It agrees that any Contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to the OGDCL under any law, Contract or other instrument, be voidable at the option of the OGDCL.

58.5. Notwithstanding any rights and remedies exercised by OGDCL in this regard, the PC Contractor agrees to indemnify OGDCL for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to OGDCL in an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback paid by the Contractor as aforesaid for the purpose of obtaining or inducing the procurement of any Contract, right, interest, privilege or other obligation or benefit in whatsoever form from OGDCL.

58.6. Contractor hereby declares and acknowledges by signing the Integrity and Ethics Undertaking (**Appendix-M**) that any violation of transgression of these principles will attract disqualification and may also result in permanent debarment from future Contract or Tendering Process.

59.0 INSURANCE & LIABILITIES

After execution of contract, the PC Contractor will procure following insurance policies from **National Insurance Company Limited (NICL)** as soon as possible preferably before execution of work or supply of material. Such time for procurement of policies should however not exceed thirty (30) days from the date of execution of the contract.



- Construction All Risk Physical Damage Policy
- Third Part Liability Policy, AND
- Workmen Compensation Policy

Such insurances shall be evidenced by standard insurance policies in form and substance satisfactory to OGDCL and shall be issued by such insurance companies in respect of which consent of OGDCL has been obtained. A copy of each of the policies will be endorsed to OGDCL by the insurer.

Each policy shall name OGDCL as the insured and one original copy to be provided to OGDCL. The PC Contractor shall cause all such insurances to be maintained in full force and effect till commissioning assistance and handover of the Project to OGDCL.

- **Construction All Risk Policy**

The PC Contractor shall procure and maintain a construction (erection) all risk policy

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including sabotage and terrorism for sum assured value of not less than contract value. The policy will cover all physical loss or damage caused or done to permanent completed or in progress, construction, commissioning assistance and performance testing phases of work with extended coverage for equipment/material stored at the Site and OGDCL's existing facilities (if any).

- **Third Party Liability Policy**

The PC Contractor shall procure and maintain Third Party Liability Insurance for sum insured to cover any claim(s) arisen on account of death, injury and /or disease to persons (other than employees of the PC Contractor), or loss or damage to any other party/ property out of/ in connection with/in the course of performance of the Contract.

- **Workmen Compensation Policy**

The PC Contractor for itself and for its Sub-PC Contractors shall obtain insurance covering damages or compensation payable in respect of, or in consequence of any accident or injury resulting to any workman, or any other person, in the employment of the PC Contractor or any of its Sub-PC Contractors, with an insurer approved, by OGDCL.



60.0 CHANGE ORDERS

Subject to the provisions of Article 61.0 hereof OGDCL shall have the power to order the PC Contractor at any time when necessary, prior to the completion of the Project to make variations to the Work as outlined below:

- Require supply of additional equipment/material, items or carryout /additional/extra work or deletion (where required i.e. supply or services), which may be required for the Project.
- Change the character or quality or kind of equipment/material, item or Work,
or
- Omit any equipment/material, item or work, or

No such variation shall in any way validate or invalidate the Contract but the value (if any) of all such variations shall be taken into account in ascertaining the amount of the Contract Price and shall be calculated and paid to or deducted from the PC Contractor as per the prices given in Price Schedule, Schedule of Prices/Rates for additional supply or on cost plus handling/services charges @ 05% of the value of item/work.

Any such request by OGDCL for variations, changes or additions to the Scope of Work shall be submitted to PC Contractor in writing, signed by OGDCL's Representative in the form of a written change request.

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When PC Contractor has received any written change request from OGDCL, which may involve a change in the Contract Price, PC Contractor shall, as soon as possible and before proceeding with the changes, advise OGDCL in writing to that effect, and obtain OGDCL approval. The price and program effects, if any occasioned by any such changes, shall be added to or deducted from the Contract Compensation as the case may be. The amount of such difference shall be determined in accordance with the prices/rates given in Price Schedule, Schedule of Prices/Rates for additional supply or on cost plus handling/service charges @ 05%. In case of cost plus basis all the required details shall be provided to OGDCL/Consultant so that the price reasonableness can be determined.

In all cases PC Contractor shall furnish a breakdown in sufficient details to permit an analysis of all equipment/materials, labor, equipment, Subcontracts and the estimated project time schedule overruns and under-runs covering all elements resulting in a change in the Contract Price or Project Execution Schedule.

Any changes or alterations ordered by OGDCL shall not in any way vitiate or invalidate the obligations of PC Contractor under the Contract, unless expressly stated in the Change Orders.

After OGDCL has accepted all the consequences resulting from a change request, a Change Order shall be signed by both OGDCL & PC Contractor.



PC Contractor shall make no additions, changes, alterations, omissions, perform no additional/extra work nor supply additional/extra equipment/materials of any kind, except when a prior approval of OGDCL in form of a Change Order has been obtained.

All additional payments for supply of equipment/material, required work or services under the provisions of this Article shall be embodied in a Change Order upon conditions specified therein which shall be signed by OGDCL and PC Contractor, and such Change Orders shall be deemed to form part of the Contract and subject to all terms and conditions therein, unless otherwise clearly exempted in Change Order.

PC Contractor shall proceed with additional/extra supply or work or changes after a Change Order has been signed. Until that time PC Contractor shall proceed with the original work unless instructed by OGDCL/ Consultant to stop such work, which may be affected by the change request.

Change requests may also be initiated by PC Contractor in which case it shall follow the same procedure as mentioned above after having been approved by OGDCL.

Notwithstanding the content of any Change Order by OGDCL the PC Contractor shall use

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his best endeavors to complete the Project by the Completion date provided that if the PC Contractor should by reason of such Change Order be unable to complete the Project by the Completion date he shall give notice in writing to OGDCL/Consultant

61.0 CONTRACT AMENDMENTS

Change Orders may be carried out by the PC Contractor without an amendment to the Contract provided that the cumulative value of all Change Orders made hereof do not exceed 10% of the Contract Price. Before any work shall be performed under a Change Order the effect of which is that the cumulative value of all Change Orders made hereof would exceed 10% of the Contract Price OGDCL and the PC Contractor shall sign an amendment to the Contract. Subsequently, if the value of change orders exceeds 10% of the contract price, OGDCL and the PC Contractor shall sign a further amendment to the Contract.



ATTACHMENT - I

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ATTACHMENT-I

MECHANICAL ACCEPTANCE CERTIFICATE

Effective Date:

CONTRACT No..... Dated.....

Between:

Oil & Gas Development Company Limited (hereinafter called OGDCL)

And..... (Hereinafter called PC Contractor)

1. When whole of the work have been completed mechanically, electrically, instrumentation, etc. & have satisfactorily passed the mechanical, electrical, instrumentation completion, inspection & testing, pre-commissioning and Mechanical Acceptance as described in Article 45.1 OGDCL hereby certifies that the following functional Systems of the PLANT are mechanically completed, accepted and have been tested and pre-commissioned in accordance with the requirements of the Contract and are therefore in readiness for commencement of the associated commissioning activities, in accordance with the requirements of the Contract, with the exception of the outstanding items listed upon the attached Punch List, it being understood that should PC Contractor fail to complete all of the outstanding items in respect of a System within the respective period stated upon the Punch List the present Certificate shall be null and void in respect of such Systems:

.....
.....
.....

2. Issuance of the Mechanical Acceptance Certificate shall not relieve the PC Contractor from his warranty obligations and other provisions of the Contract which expressly or by their nature survive the said certificate.

For and on behalf of
(Oil & Gas Development Company Limited)



For and on behalf of
(Contractor)

Signature:
Name:
Position:

Signature:
Name:
Position:



ATTACHMENT - II

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ATTACHMENT-II

CERTIFICATE OF COMPLETION



FOR

(Contract Designation)

To: _____
(OGDCL)

I, the undersigned PC Contractor for the above Designated Contract (hereinafter called the “PC Contractor”) with oil and gas development company limited (OGDCL) (hereinafter called the “OGDCL”) do hereby certify that:

1. The work to be performed by _____ pursuant to the contract dated _____ is completed and is in all respect in strict compliance with the provision of the Contract, including all plants, specification, maps and contract drawings and modification thereof and vendor information, complete in all respects.
2. Payments have been made in fully by the PC Contractor to all person/firms who have furnished labor and material for this contract.
3. The PC Contractor has obtained valid release of lien from all person, firms, and/or corporation furnishing materials, supplies and appliance, which were employed by the PC Contractor in the performance of this contract, and such releases have been delivered by the PC Contractor or the OGDCL.
4. The complete cost account statement attached hereto and made a part hereof a complete and accurate cost break-down, and in accordance with the cost account code, given to the PC Contractor by OGDCL, of all materials, equipment and work performed in accordance with the contract
5. All defects in equipment, materials and workmanship reported by the OGDCL have been corrected by the PC Contractor.

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6. The total true and correct cost of the contract as so completed is _____ total currency in Pakistan Rupees _____ of this total the entire balance now due to the PC Contractor is _____ total currency in Pakistani Rupees _____.

We certify that the above designated contract has been completed in accordance with the provisions of said contract dated _____ provided however that the acceptance of the PC Contractor's work by OGDCL shall not be deemed to relieve the PC Contractor of his obligation contained in the contract with respect to defective workmanship, materials, or equipment discovered with the guarantee period.

(PC Contractor)



By: _____

Title: _____

Date: _____



ATTACHMENT - III

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ATTACHMENT-III

ACCEPTANCE CERTIFICATE

Effective Date:

CONTRACT No..... Dated.....

Between:

Oil & Gas Development Company Limited (hereinafter called OGDCL)

And (Hereinafter called PC Contractor)

Whereas the PLANT and the WORK, as specified in the Contract, have been accepted under the form of the TAKE OVER CERTIFICATE dated: .../.../....

And

Whereas the Warranty Period pursuant to Article 34.0 of the Contract is now completed, both PARTIES agree that:

1. Pursuant to Article 34 (Warranties) of the Contract, it is hereby certified and agreed, by the issuance of the FINAL ACCEPTANCE CERTIFICATE, that the PC Contractor obligations under the Contract have, effective upon the .../.../...., been fulfilled.
2. Issuance of this ACCEPTANCE CERTIFICATE shall not relieve PC Contractor from any obligations and other provisions of the Contract which expressly or by their nature survive the said certificate.

For and on behalf of
(Oil & Gas Development Company Limited)

For and on behalf of
(Contractor)

Signature:

Signature:

Name:

Name:

Position:

Position:

In presence of:

In presence of:

Signature:

Signature:

Name:

Name:



Position:

Position:

Date:

Date:

ATTACHMENT - IV

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ATTACHMENT-IV

UNDERTAKING

Oil & Gas Development Company Limited (hereinafter called OGDCL)
Islamabad.

Contract No. and Date: _____

DESCRIPTION OF WORK

The above WORKS have been completed in accordance with the provision of the Contract.

The undersigned hereby releases and forever discharges the Oil and Gas Development Company Limited (OGDCL) their successors and assigns, and their property, from all claims and demands whatsoever in any manner arising out of or related to the Contract or labor performed or material furnished by the undersigned in connection with, or incidental to the execution and completion of the WORKS.

In consideration of and for the purpose of OGDCL to issue the Acceptance Certificate and make the final payment, the undersigned hereby present, warrants and agrees that:

1. All sums due to become due and all debts, accounts, damages, obligations, claims and demands of every nature and kind whatsoever in any manner arising out of, or related to labor performed or material furnished in connection with, or incidental to the contract have been paid and satisfied.
2. There are no unsettled claims of any nature what so ever including for injuries to or death of person or damage to, or destruction of property in any manner arising out or related to the Contract and
3. The undersigned shall indemnify and hold harmless OGDCL successors and assigns from and against all claims, demands, liens, claims of lien, judgments, attachments and related costs and expenses in any manner, arising out of, or related to the Contract.



IN WITNESS WHEREOF, the PC Contractor has caused this instrument to be executed by its duly authorized representative(s) this ____ day of _____.

(Contractor)

FOR AND ON BEHALF OF



ATTACHMENT - V

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ATTACHMENT-V

CERTIFICATE OF COMPLIANCE
FOR

(Contract Designation)

To: _____
(OGDCL)

I, the undersigned PC Contractor for the Contract above do hereby certify that:

The work to be performed by _____ (hereinafter called the “PC Contractor”) pursuant to the Contract dated _____ has been completed as of _____ and, to the best of my knowledge, was performed in all respects in strict compliance with the terms and conditions of the Contract and all laws of the city of _____ and the country of Pakistan.

(PC Contractor)

By: _____



Title: _____

Date: _____

I, _____, a Notary public of _____
(Name of Deponent) hereby certify that _____ (Title)
of _____ whose name of signs
to the foregoing instrument, a knowledge before me this day that he, with full authority executed
the foregoing instrument for _____ (Name of Organization).

Given under my hand and seal this _____ day of

ATTACHMENT - VI

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ATTACHMENT - VI

TERMS AND CONDITIONS OF THE INLAND L/C FOR SUPPLY



1.0 PAYMENT DOCUMENTS

Payment documents shall consist of the following:

- 1.1. Original Commercial Invoice showing material description quantity unit and total price duly verified by OGDCL showing:
 - 1.1.1. Complete, first and last shipment payment (if all material is shipped in one lot)
 - 1.1.2. First partial shipment/second partial shipment (and so on) Final and last shipment as the case may be if shipments are effected in parts
 - 1.1.3. All invoices should be signed and must indicate value of each item total value provided in the contract
- 1.2. Original GST Invoice
- 1.3. Clean Truck /Carrier receipt showing freight pre-paid
- 1.4. Packing List showing Weight in Kilograms (Gross/Net).
- 1.5. Technical Catalogue / literature copy (where applicable)
- 1.6. Certificate the goods are brand new and conform to the contract specification
- 1.7. Copy of NTN certificate
- 1.8. Sales Tax Payment proof (Annexure-C) issued by FBR
- 1.9. Copy of valid tax exemption certificate in case of exemption granted by FBR (if applicable)
- 1.10. Copy of valid Professional Tax Paid /Clearance Certificate
- 1.11. Mill inspections /Quality certificates (where applicable)
- 1.12. Warranty Certificate
- 1.13. Certificate of origin
- 1.14. Duly signed and stamped delivery note
- 1.15. Certificate issued by beneficiary that packing of the material conform to the International Standards and all packages/boxes bear the Purchase Order No. and Weight in Kilograms (Gross/Net).

2.0 DEDUCTION OF WITHHOLDING/SALES TAX

All payments shall be subject to deduction of withholding/sales tax as applicable on prevailing rates. If the PC Contractor is entitled for any exemption from the withholding tax or a reduced rate of withholding tax, he shall obtain a valid certificate from the relevant tax authority in Pakistan and submit it to OGDCL

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3.0 DELIVERY INTIMATION

i. The beneficiary immediately of making shipment must sent fax OR E-mail to



- (1) Stores Officer,
Oil & Gas Development Company Limited,
Maru-Reti Gas Field _____,
District _____ Sindh Province, Pakistan
Telephone No. _____
Fax No. _____
E-mail: _____
- (2) Manager (Foreign) Procurement,
OGDCL House Plot No. 3 (New NO. 3013)
F-6/G6, Jinnah Avenue, Islamabad.
Tel: 051-920023780
E-mail: ejaz_rizvi@ogdcl.com,
- (3) Manager (Projects)
Tel: 051-920023644
EMAIL: iftekhar_ahmed@ogdcl.com

intimating them the following;

- a) L/C number and Contract No.
- b) Total FOR value of the consignment shipped.
- c) No. of boxes/package/pieces etc.
- d) Net and gross weights.
- e) Expected time of arrival (ETA) of material.

4.0 MECHANISM FOR CLAIM OF PAYMENT

- a) The beneficiary should negotiate the original clean payment documents after making delivery and verification of commercial invoice which should be free from any discrepancy with negotiating bank as indicated in the L/C.
- b) If clean documents free from discrepancy are not negotiated within negotiation period mentioned in the L/C. or if the documents are withheld by the Bank on account of any discrepancy it shall be without any financial impact if any incurred due to late negotiation of clean documents will be on beneficiary's account.

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- c) Original documents must contain at least four sets.
- d) The discrepant documents with minor discrepancies may be accepted subject to the consent of OGDCL.

5.0 LIQUIDATED DAMAGES

- a) If the contractor fails to deliver any or all of the goods within the time period(s) specified in the Contract, the Purchaser shall, without prejudice to other remedies under the contract, deduct from the contract price / Bank Guarantee as liquidated damages, a sum not more than 0.5% of the contract price per week or part thereof for first four weeks, 1.00% per week for next four weeks and 1.5% per week exceeding four weeks up to maximum extent of 10% of the contract value.
- b) In case the Purchaser is satisfied that the delayed / defective shipment was due to some mistake or circumstances beyond the control of the contractor and the contractor has not intentionally or negligently contributed in the delay, the Purchaser may impose Liquidated Damages for not more than a sum equivalent to 0.5% of the delayed or defective shipment per week or part thereof for first two weeks, 1.00 % per week for next three weeks and 1.5% per week exceeding five weeks but not exceeding 10% of the contract value of the delayed/ defective shipment provided that the contractor takes immediate remedial measures for the-replacement of defective shipment and takes prompt steps to mitigate the delay. The Purchaser may however, impose Liquidated Damages as per (a) above if the delayed or defective shipment has affected the project completion schedule or has resulted in production losses.
- c) Even after imposition of LDs, if the supplier fails to materialize the delivery (material and or services); the Purchaser reserves the right to cancel Purchase order/contract/LC and to forfeit the Guarantee (if applicable) after intimating the supplier for such cancellation / forfeiture.

6.0 AMENDMENT/EXTENSION OF L/C

The beneficiary will positively confirm shipment of all ordered materials within L/C validity or made request for extension of shipment and negotiation dates at least 15 to 30 days prior to the expiry of L/C. If shipment is not effected within L/C validity or request for extension is not received 15 to 30 days prior to expiry of L/C validity, no request for grant of extension in shipment and negotiation period will be entertained under any circumstances. In case of extension in shipment/negotiation period, the beneficiary will be required to extend the validity of his performance bond (if provided) accordingly. All charges on this account will be on beneficiary's account.



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7.0 CHARGES FOR L/C ESTABLISHMENT

- 7.1. All Charges of the bank for credit opening will be borne by the OGDCL.
- 7.2. All charges of corresponding bank such as negotiation of documents, adding confirmation to credit etc. will be to the account of beneficiary.
- 7.3. All charges for amendments/extension in L/C will be to the account of beneficiary.

8.0 PAYMENT TERMS (As per tender document)

ATTACHMENT - VII

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ATTACHMENT - VII

TERMS AND CONDITIONS OF THE INVISIBLE L/C FOR SERVICES

1.0 WORKS (COVERING INSTALLATION/ERECTION)

OGDCL shall make progressive payments to PC Contractor on monthly basis against PC Contractor's invoices giving details of specific work and its completion status. The payment shall be made considering the Bid Price Schedule of Works and verified percentage completion of work. The measurement/verification mechanism for progressive payments of Works is detailed in **Appendix-L**. The measurement/ verification of Works will be made by OGDCL/Consultant based on progress reports submitted by the PC Contractor and actual progress at site.

2.0 PRE-COMMISSIONING, COMMISSIONING & START-UP ASSISTANCE (INCLUDING PERFORMANCE TESTING)

The pre-commissioning, commissioning & Start-Up assistance charges shall be paid on successful commissioning performance testing of the plant by OGDCL and submission of PC Contractor's invoice duly verified by OGDCL.

3.0 DOCUMENTS REQUIRED



Payment against the letter of credit shall be effective upon submission of following clean documents along with valid copy of NTN and valid professional certificate, GST invoice and Annexure-C issued by FBR:

3.1. Works (Covering Installation/Erection)

OGDCL shall make progressive payments to PC Contractor on monthly basis against PC Contractor's invoices giving details of specific work and its completion status. The payment shall be made considering the Bid Price Schedule of Works and verified percentage completion of work. The measurement/verification mechanism for progressive payments of Works is detailed in **Appendix-L**. The measurement/verification of Works will be made by OGDCL/Consultant based on progress reports submitted by the PC Contractor and actual progress at site.

3.2. Pre-commissioning, Commissioning & Start-Up Assistance (including Performance Testing)

The pre-commissioning, commissioning & Start-Up assistance charges shall be paid on successful commissioning performance testing of the plant by OGDCL and

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submission of PC Contractor's invoice duly verified by OGDCL.

3.3. **Invoicing Procedure**

For progressive payment of works on a day in each month, to be agreed between the OGDCL's representative and the PC Contractor's representative the PC Contractor shall in respect of all amount owing to him submit an invoice with relevant supporting documents, in three copies, to the OGDCL's Representative with a Work progress report for OGDCL's approval and signature. OGDCL's Representative shall authorize in writing payment to the PC Contractor as ascertained in accordance with the above.

3.4. **Timing for Payment**

The Payment of undisputed invoices shall be made in full not later than forty-five (45) as per QP tender document days after OGDCL has authorized such payment in writing, provided OGDCL's representative has first certified such invoice and PC Contractor has fulfilled all requirements for the release of payment, OGDCL shall pay the amount due less applicable taxes and any amounts which may be due to OGDCL.

3.5. **Deduction of Withholding/Sales Tax**



All payments shall be subject to deduction of withholding/sales tax as applicable on prevailing rates. If the PC Contractor is entitled for any exemption from the withholding tax or a reduced rate of withholding tax, he shall obtain a valid certificate from the relevant tax authority in Pakistan and submit it to OGDCL

3.6. **Disputed Invoices**

If any invoice or an amount of invoice is disputed, OGDCL shall within ten (10) days of receipt of invoice inform the PC Contractor the grounds on which payment of the invoice or an amount is disputed. Efforts shall be made by both parties to resolve the dispute within a period of thirty (30) days.

4.0 **LIQUIDATED DAMAGES**

If the contractor fails to deliver any or all of the goods within the time period(s) specified in the Contract, the Purchaser shall, without prejudice to other remedies under the contract, deduct from the contract price / Bank Guarantee as liquidated damages, a sum not more than 0.5% of the contract price per week or part thereof for first four weeks, 1.00% per week for next four weeks and 1.5% per week exceeding four weeks up to maximum extent of 10% of the

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contract value.

In case the Purchaser is satisfied that the delayed / defective shipment was due to some mistake or circumstances beyond the control of the contractor and the contractor has not intentionally or negligently contributed in the delay, the Purchaser may impose Liquidated Damages for not more than a sum equivalent to 0.5% of the delayed or defective shipment per week or part thereof for first two weeks, 1.00 % per week for next three weeks and 1.5% per week exceeding five weeks but not exceeding 10% of the contract value of the delayed/ defective shipment provided that the contractor takes immediate remedial measures for the-replacement of defective shipment and takes prompt steps to mitigate the delay. The Purchaser may however, impose Liquidated Damages as per (a) above if the delayed or defective shipment has affected the project completion schedule or has resulted in production losses.

Even after imposition of LDs, if the supplier fails to materialize the delivery (material and or services); the Purchaser reserves the right to cancel Purchase order/contract/LC and to forfeit the Guarantee (if applicable) after intimating the supplier for such cancellation / forfeiture.

5.0 CHARGES FOR L/C ESTABLISHMENT

- 5.1. All Charges of the bank for credit opening will be borne by the OGDCL.
- 5.2. All charges of corresponding bank such as negotiation of documents, adding confirmation to credit etc. will be to the account of beneficiary.
- 5.3. All charges for amendments/extension in L/C will be to the account of beneficiary.

6.0 PAYMENT TERMS (As per tender document)