



Announcement of PTT Public Company Limited

Registration Number 0107544000108

PR No. 1120018712

Subject: Bid for Hiring of Engineering, Procurement and Construction for GSP Optimal Fuel Gas Network

As PTT Public Company Limited intends to invite written Bid for **Hiring of Engineering, Procurement and Construction for GSP Optimal Fuel Gas Network**

Place of delivery at : The contractor shall deliver the job at the PTT Rayong Gas Separation Plant, 555 Sukhumvit Road, Mab Ta Phut, Muang, Rayong 21150.

Within 13 times within 630 days (counting continuous everyday), Starting from the date after the CONTRACTOR received a Notice of Commencement of Work.

according to the conditions/detail/drawing and the documentation attached to the announcement, which shall be considered as part of this Instruction to Bid, as follows:

- Terms of Reference	1 Set
- Form of Power of Attorney	1 Page
- Form of Bank Guarantee	1 Page
- PTT Supplier Sustainable Code of Conduct	1 Set
- Price Bid Form	1 Set

Pre-Bid Conference for clarification shall be held at Room M202 at GSP Rayong on 27 April 2023 Registration for the Conference shall be during 13:30 to 13:45 and conference shall commence at 13:45 hours. (Speaker MR. TEERAYUT NIMNUY Employee ID No. 550145 Tel. 084-4075469 (teerayut.n@pttplc.com))

Site examination shall be held at Room M202 GSP Rayong for Safety moment and Site survey afterward on 28/04/2023 at 09:00 hour.

The bidder who does not attend the pre-bid conference / conduct site examination shall be ineligible to tender.

Submission of Bid Price, evidence and technical documents shall be on 12 June 2024 at 09:00 - 15:00 hour, as follows:

- Procurement section , GSP Procurement & Inventory Management, Division. Gas Separation Plant Rayong, 555

Sukhumvit Road, Mabtapud, Muang, Rayong 21150

Person who is interested may purchase Bid Documents at the price of Baht - per set (Vat included) from 19 April 2023 to 26 April 2023 during 09:00 - 15:00 hours (NOTE : (The vendor who interested this bid, please provide the "Memorandum of Association" and



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"Email who intend the bid clarification" via Email : prangchanok.p@pttplc.com, kunsriwimol_b@pttplc.com and specific "PR 1120018712" on Email subject within date & time as above)) as follows:

- Procurement section , GSP Procurement & Inventory Management, Division. Gas Separation Plant Rayong, 555 Sukhumvit Road, Mabtapud, Muang, Rayong 21150
(MISS PRANGCHANOK PALAKAWONG Tel. 038-676178)

Announced on 19 April 2023

(MR. KRITSARA KHONGNUAL)

Procurement Section Head

Procurement section



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

Terms Of Reference

PTT Public Company Limited (hereinafter called “PTT”) would be interested to hire an EPC Contractor who will be responsible for providing engineering, procurement, construction, commissioning and related services of the GSP Optimal Fuel Gas Network Project as following

1. Objective

PTT Public Company Limited (PTT), Gas Separation Plant (GSP) has intended to improve GSP Optimal Fuel Gas Network. There are 5 scopes of work as follows:

1. HP Flash Gas from GSP6 pipeline to Remaining Gas Treatment (RGT) at GPPP

New HP flash gas from GSP6 (3601-1/2-T-002) is diverted from being used as LP fuel gas to the Remaining Gas Treatment for blending with the sales gas system.

2. Comprehensive Wastewater Treatment Plant (CWWTP) Modification

The mainly CWWTP is separated into 3 sub-work order as follows:

- Increase of Dissolved Air Floatation unit (DAF) efficiency
- Installation of new Advanced Oxidation Package (AOP)
- Installation of new Activated Carbon Filter and Carbon Fine Filter at GPPP area

3. Modification for Booster compressor suction pipeline and control system to LP Fuel System for GSP6 and ESP

Based on the original design, fuel gas being used in the ESP and GSP6 is taken from the discharge of the Sales Gas Compressor. However, for energy saving, the fuel gas can be taken from the suction Residue Gas Booster Compressors (3203-C-001 and 3603-C-001). The new 8" Residue gas line with pressure control valve shall be provided.

4. New Refrigeration system for Remaining Gas Treatment (RGT)

Based on the current operation of the existing remaining gas system, the refrigerant used for Remaining Gas Cooler (5590-E-004) is supplied from GSP3. However, to provide more flexibility, a new refrigeration system is provided.



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By :

MR. TEERAYUT NIMNUY

MR. SAHAPONG NOPCHAROEN

MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

5. New Regeneration Gas Compressor systems for GSP2 and GSP3

The new Regeneration Gas Compressors shall be provided at GSP2 and GSP3. The compressors will be used for sending the regeneration gas to the sales gas header.

2. Bidder Qualifications

2.1 Bidder shall carry out the business involving the products to be offered.

2.2 Bidder must not have the following characteristics as prohibited by the Blacklist:

2.2.1 Being a person or juristic person who has been convicted by the National Anti-Corruption Commission of Thailand (NACC), such a person shall no longer be considered to possess the prohibited characteristics described in this clause if they receive a final verdict of not guilty; or

2.2.2 Being a person or juristic person who is a party in any dispute or lawsuit against PTT that resulted in criminal penalties, excluding petty offenses.

The person or juristic person in the first paragraph shall be released from the prohibited characteristics (Blacklist) in the following cases:

2.2.2.1 A case where PTT is a defendant and a final judgment has been reached;

2.2.2.2 A case where PTT is the injured party and a final judgment has been reached indicating that the person did not commit the offense as charged;

2.2.2.3 A case where PTT is the injured party and a final judgment has been reached indicating that the person did commit the offense as charged, but the person has already served their punishment, completed their parole period, or has been awaiting sentence for at least three years; and

2.2.2.4 A criminal case that has been resolved through the withdrawal of the complaint or lawsuit, or has been disposed from the directory.

In accordance with Clauses 2.2.2.1 to 2.2.2.4, if the counterparty is a juristic person, the directors of the limited company, partners with unlimited liability, or authorized directors of the public company limited, shall be subject to and exempt from the prohibited criteria (Blacklist) in the same manner as the juristic person.



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In the case that Clause 2.2.2.3 applies and a final judgment is reached determining that the juristic person has committed an offense as charged, but it appears that the directors of the limited company, partners with unlimited liability, or authorized directors of the public company limited did not participate in the commission of the offense, and such directors or partners have resigned from the juristic person, then such directors or partners shall be released from the prohibited characteristics (Blacklist).

In the event that a final judgment imposes different period of punishment or parole on the juristic person, the directors of the limited company, partners with unlimited liability, or the authorized directors of the public company, the longest period of punishment or parole will be used to determine release from the prohibited characteristics.

2.2.3 Being a person or juristic person whose contract has been terminated by PTT due to committing the corrupted act against PTT;

2.2.4 Being a person or juristic person in the process of being ordered bankrupt by the court, or a person received a receivership order from the court in the context of a bankruptcy case, either temporarily or absolutely, and for which a final verdict has not been issued to resolve the case, cancel the bankruptcy, or discharge the bankruptcy, regardless of whether the court has approved a composition in bankruptcy for such person; and

2.2.5 Being a person or juristic person who has been in the Thailand designated list announced by the Anti-Money Laundering Office under the law of Counter-Terrorism and Proliferation of Weapon of Mass Destruction Financing Act. If the entity referred to in Clause 2.2 is a juristic person, the directors of the limited company, partners with unlimited liability, or the authorized directors of the public limited company, shall be included.

2.3 Bidder shall not be a person with a previous record of abandoning any work undertaken as declared by PTT and The Comptroller General's Department.

2.4 Bidder shall be the person or persons who purchased/received the Bid Documents and may not assign to other persons the right to submit the Bid.

In the case of the Bidder being a partnership/ consortium/ joint venture, the mentioned Purchaser/ Receiver must be a party of the said partnership/ consortium/ joint venture. Hence, the Bidder in the form of partnership/ consortium/ joint venture shall be obligated as a joint debtor to PTT.



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2.5 On the day of announcement/bid invitation, should not have any joint interest with other bidders or is not a person who will cause obstruction for a fair auction.

2.6 Bidder shall have the registered capital minimum 100 million Baht. In case of consortium or joint venture, at least one party shall fulfill this requirement.

Or the Bidder can however use financial strength of its Parent Company to fulfil the Financial Eligibility criteria as mentioned above. In such case, Bidder shall submit an Undertaking from the Parent Company as per Attachment 3.2.7

UNDERTAKING FORM THE FINANCIALLY ENTITY OR ITS PARENT COMPANY and also furnish a certificate of relationship of Parent Company with the Bidding Company as per Attachment 3.2.6 FORM FOR CERTIFICATE OF RELATIONSHIP OF PARENT COMPANY, Company Secretary certificate towards shareholding pattern of the Parent Company and the Bidding Company along with a Board resolution from the Parent Company.

2.7 The Bidder shall have adequate funds to meet financial obligations incident to this work and not financial problems against him from any party during the past 3 consecutive years (2019 - 2021).

2.8 The Bidder shall request a credit certificate from a bank for PTT to consider, provided that the credit line/credit certificate from a bank for this project shall not be less than 200 million Baht.

2.9 The Bidder or a company associated with the Bidder shall have adequate technical knowledge and practical experience in accordance with all laws and regulation of Thailand.

2.10 The Bidder or Consortium Bidder or Joint Venture Bidder, at least one party shall have experience in Compressor Package including Engineering, Installation and Commissioning sizing 1 MW in minimum at least 1 project reference. The evidence shall consist of sufficient detail on each project to indicate the magnitude and complexity of the project and a clear statement of the responsibility on the project. The given information should also include the in-service date of each project and the name of the owner of each project. Or the Bidder can however use the technical project references of its Parent Company to fulfil the Technical criterial mentioned above. The evidence shall consist of sufficient detail on each project to indicate the magnitude and complexity of the project and a clear statement of the responsibility on the project. The given information should also include the in-service date of each project and the name of the owner of each project. In such case, Bidder shall submit an Undertaking from the Parent Company as per Attachment 3.2.7 UNDERTAKING FORM THE



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FINANCIALLY ENTITY OR ITS PARENT COMPANY and also furnish a certificate of relationship of Parent Company with the Bidding Company as per Attachment 3.2.6 FORM FOR CERTIFICATE OF RELATINSHIP OF PARENT COMPANY, Company Secretary certificate towards shareholding pattern of the Parent Company and the Bidding Company along with a Board resolution from the Parent Company.

Bidders are advised that noncompliance with the above requirements shall be caused for rejection of proposals.

3. Bid Evidence

Bid shall be enclosed in sealed envelope consisting of separate envelopes as follows:

(3.1) Envelope of bid qualification

(3.1.1) In case of Bid by an individual business owner, there shall be enclosed a copy of a value added tax certificate and a copy of a commerce registration certificate, certified by the owner or manager and affixed with the official seal (if any).

(3.1.2) In case of Bid by a company or partnership registered in Thailand, there shall be enclosed a certificate of incorporation issued by the Ministry of Commerce which is not more than 6 (six) months recent as from the date after the day of issuance up to the date of submitting Bid document. Unless it is an original, such certificate shall be affixed with a signature of the authorized person and the official seal of the company or partnership in authentication thereof.

(3.1.3) In case of Bid by a company or partnership registered in a foreign country, Bidder shall enjoy no immunity or protection allowing non-submission to Thai court, unless such privileges and immunities have been waived by the instruction of Bidder's government..

(3.1.4) In the case where the authorized person of an individual business owner, company or partnership ("Entity") does not sign the bid documents by himself and appoints a person to sign such documents on behalf of the Entity, such entity shall have to enclose a valid power of attorney which clearly and correctly states such authorization. The bidder may also have another person submit the said bid documents to PTT. However, the bidder has to certify that he will be responsible to PTT for any acts of such person in relation to submitting of the bid documents as if it is done on the bidder's behalf.

(3.1.5) Certified copy of Thai ID./passport of the authorized signatory or copy of Thai ID./passport of grantee and grantor attached to a power of attorney.



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(3.1.6) In the case where registration of value added tax has been effected, there shall be enclosed a copy of VAT Certificate (Form Bhor. Por. 20).

(3.1.7) In case of Bid by a company or partnership registered in a foreign country, there shall be enclosed

1) Certificate of Incorporation and/or Memorandum of Association and/or any other documents likewise issued by the competent agency/organization, which enables to identify the authorized person including Bidder's registered objectives that accord with the procurement work.

2) Articles of Associations (If any)

3) Power of Attorney) (If any)

4) Certificate of specimen signature or other documents that present signature.(If any)

(3.1.7.1) The list of documents in (3.1.7) 1) - 3) must be notarized by Notary Public and legalized by Thai Embassy or Thai consulate which has the jurisdiction, not more than 1 year recent as from the date after the day of notarization and legalization up to the date of submitting Bid document.

(3.1.7.2) In the event that the Bidder do not wish to proceed in (3.1.7.1) , the Bidder can submit Letter of Certification of Information and Documents submitted to PTT instead, according to attached Form.

(3.1.8) In case of Bidder is consortium or joint venture, the following information is required.

(3.1.8.1) Description of the Consortium / Joint Venture, the division of responsibilities and the Scope of Work of each member during engineering, procurement, construction, training and commissioning.

(3.1.8.2) Name of the leader of the Consortium or Joint Venture and names and functions of the authorized representative(s) of the Consortium or Joint Venture.

(3.1.8.3) Complete copy of the Consortium or Joint Venture agreement either signed by each of the members or evidence provided that each of the members will sign the agreement on issue of any Notice of Award.

(3.1.8.4) Confirmation of joint and several liability (The leader of the Consortium or Joint Venture must be nominated. The leader shall be authorized to commit the Consortium or Joint Venture and to act on its behalf in all matters related with the Bid and the Contract.



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(3.1.8.5) Description of projects and working relationships, if the members have been working together previously on other projects.

(3.1.8.6) The Bid shall be signed so as to be legally binding on all partners. Signatory (ies) must have Power of Attorney, approved by public notary and certified by the Thai Embassy or Thai Consulate.

(3.1.8.7) The members of the Consortium or Joint Venture shall remain firm and committed throughout the bidding period and after CONTRACT Award.

(3.1.8.8) No changes in the agreement of the Consortium or Joint Venture or its organization will be allowed unless approved by PTT; otherwise, the Bid will be rejected. If the agreement is allowed to change, the Bidder shall bear all costs and expenses incurred in providing PTT with the new agreement.

(3.1.8.9) Each Bidder will be limited to Submission of one Bid only.

(3.1.9) Covering Letter

(3.1.10) Information on Bidder: 2 copies of hardcopy and 1 electronic format

(3.1.10.1) Names and functions of the authorized representative (s) of the Bidder.

(3.1.10.2) Organization chart of Bidder's company showing details of Bidder's corporate organization.

The Bidder shall provide evidence that they comply with the eligibility requirements specified in this Article 2 and submit all of the qualification forms in Attachment 3.2 in the order listed:

(3.1.10.2.1) CERTIFICATE of Eligibility in the form in the Term of References, Attachment 3.2.1, CERTIFICATE of Eligibility.

(3.1.10.2.2) FORM OF SECRECY AGREEMENT in Attachment 3.2.2.

(3.1.10.2.3) Joint Venture of Consortium must comply with the requirements of the Term of References, and submit an agreement in the form of the Term of References, Attachment 3.2.3, Form of Joint venture or Consortium Agreement.

(3.1.10.2.4) Information on Financial Capability in the form of the Term of References, Attachment 3.2.4, Financial Capability.

(3.1.10.2.5) Project References of Bidder in accordance with the requirements and in the form of the Term of References,



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Attachment 3.2.5, Reference of Bidder.

(3.1.10.2.6) FORM FOR CERTIFICATE OF RELATIONSHIP OF PARENT COMPANY in Attachment 3.2.6.

(3.1.10.2.7) UNDERTAKING FORM THE FINANCIALLY ENTITY OR ITS PARENT COMPANY in Attachment 3.2.7.

(3.2) Envelope of technical documents : 2 copies of hardcopy and 1 electronic format

(3.2.1) PROJECT EXECUTION PROPOSAL, which shall contain the Project schedule (Level 3), project execution plan, project organization including with personnel CV, project SHE plan, laydown area outside GSP.

The personnel CV shall display Professional Engineering License Level (if any).

(3.2.2) Technical data

(3.2.2.1) Equipment datasheet; Bidder shall submit equipment datasheet compare with PTT engineering specification and PTT equipment datasheet.

(3.2.2.2) Bidder shall submit documents as following requirement

(3.2.2.2.1) Mechanical

(3.2.2.2.1.1) Vendor Datasheet including brand and model of mechanical equipment;

- Regeneration Gas Coolers GSP2, GSP3

- Refrigerant Suction Drum, Refrigerant Accumulator, Refrigerant Condenser, Desuperheater,

- Advanced Oxidation Package (e.g. ozone generator, oxygen generator)

(3.2.2.2.3) Electrical

(3.2.2.2.3.1) Datasheet including brand and model of electrical equipment; MCC panel of refrigeration gas package and LV motors of regeneration gas coolers GSP2, GSP3, refrigeration condenser

(3.2.2.2.3.2) Electrical Load List

(3.2.2.2.4) Instrument

(3.2.2.2.4.1) Datasheet including brand and model of instrument equipment; Control valves, ON-OFF Valves, Shut-off valves,



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DCS system, SIS system, FGS system (e.g. gas detector, fixed monitor, deluge valve), PLC system of Advanced Oxidation Package

(3.2.3) Exceptions and Deviations List from PTT's Terms & Conditions (Attachment 3.7). (No deviation from the PROJECT SPECIFICATION shall be preceded by BIDDER without prior written approval from PTT. PTT reserves the right to consider BIDDER who is NO deviation as the first priority).

(3.2.4) Unpriced Commercial Proposal, which shall contain all payment terms and commercial conditions, as for Priced Commercial Proposal, but excluding all lump sum prices, i.e. Attachment 3.4 should be submitted blank in price of each items.

(3.2.5) Integrity Pact (attachment 14)

(3.3) Envelope of proposal : 1 hardcopy

(3.3.1) Fixed Lump Sum Bid Price (attachment 3.3)

The Bidder shall provide the lump sum price in Attachment 3.3. This should clearly show the price for the Bid in which there are no deviations to any part of the TOR.

The Bidder shall clearly divide the prices into the USD, or EURO or YEN portion covering WORK to be performed outside of Thailand, and into Thai Baht portion covering WORK to be performed in Thailand.

Price for imported finished goods supplied from ex-stock Thailand shall be quoted in Baht currency including import duty, taxes and Value Added Tax (if any) on importation of the equipment. However, any value added tax which will be levied on the goods in connection with the sale thereof shall not be included in the quoted ex-stock price.

Price for transportation from the port of Thailand and/or from the ex-factory or ex-stock to the SITE shall be quoted in Thai Baht excluding Value Added Tax.

Price for erection, construction and commissioning shall be quoted in Thai Baht excluding Value Added Tax.

Bidder should note that the above prices should only be included in the Priced Commercial Proposal: in the Unpriced Commercial Proposal these should be left blank.

In the event the Bidder wishes to add supplemental VENDORS to the VENDOR LIST, Bidder should include in the bid form



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the price reduction available to PTT in the event that the supplemental VENDORS are acceptable to PTT.

PTT has a right to consider bidders who propose equipment based on the VENDOR LIST first.

(3.3.2) Taxes, Duties and Fees in Pricing

The CONTRACTOR is required to pay taxes and duties for import of any raw materials or imported equipment

The Bidder shall include in its Bid, any taxes imposed by the Thai Government, which will be paid by CONTRACTOR including the Bidder's Personal Income Tax.

(3.3.3) Break-down Bid Price (attachment 3.4)

The break-down of the fixed lump-sum bid price for the Bid as given in Item 1 of Fixed Lump Sum Bid Price (attachment 3.3) shall be provided in Attachment 3.4. This shall be also provided as percentage of the lump sum price. This shall be provided the price of each items.

PTT reserves the right to require Bidder to give further break-down if deemed appropriate by PTT.

(3.3.4) Unit Rates (attachment 3.5)

Unit rates shall be proposed by Bidder in Attachment 3.5 for all categories of personnel, construction, equipment and field WORK to be used for any Change of WORK according to the provisions to Article 19 of the Form and Conditions of CONTRACT. These rates shall also apply where the Change is reduction in the SCOPE OF WORK.

The rates shall be quoted in Thai Baht for costs incurred in Thailand and USD, or EURO or YEN for costs outside of Thailand. These shall be fixed and valid until FINAL ACCEPTANCE.

In addition, Bidder shall provide a procedure for fixing the cost of Changes involving equipment or materials. This shall include a percentage to cover the administration costs associated with the procurement activities.

(3.3.5) Priced Recommended Spare Part List (attachment 3.6)

The lump sum price quoted in 3.3.1 above includes the cost of commissioning spare parts. No other spare shall be included in



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the lump sum price. It is PTT's intention to procure spares themselves. To facilitate this, PTT requires CONTRACTOR to assist PTT in this regard. Bidder is required to submit a price list of spares within his bid in accordance with Bid Form Attachment 3.6.

Base Case Bid

The Bidder shall carefully examine the complete TOR. It is his responsibility to verify all information and data contained in TOR. The Bidder shall be responsible for investigating all local conditions and the applicable laws and regulations in Thailand under which the WORK has to be performed. Failure to carry out such verification and investigation shall not relieve the Bidder from his obligations stipulated in the TOR.

The Bidder shall prepare his Bid in strict adherence to the terms and conditions of the TOR. No deviations of any type (whether technical or commercial) will be accepted in the Bid.

Deviations from Base Case

In addition to the Base Case Bid, Bidders may propose exceptions or deviations from the TOR as alternatives. He may present alternatives to the commercial or technical conditions of the TOR if he expects a favorable effect on cost, time schedule, etc.

Such alternatives and the expected improvement including changes of prices shall be clearly stated in the Bid.

Exceptions and deviations not listed shall be considered as not being requested by Bidder.

PTT reserves the right to accept or refuse any exceptions or deviations submitted as an alternative. The Bidders is not permitted to alter his Bid after submission to PTT.

(3.4) Bidding Schedule

PTT's schedule for the bidding period is as follows:

Invitation to Bid: announce on PTT website.

Site Visit and Pre-Bid Conference: announce on PTT website.

Questionnaire Submission: within 14 days after Pre-Bid Conference Date.

Bid Submission: 45 days after Pre-Bid Conference Date.



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Bid Clarification: 14 days after Bid Submission.

Award Contract: 60 days after Bid Submission.

(3.5) Communication during the Bidding Period

All correspondence during the Bidding Period including clarification on the TOR shall be addressed to

PTT PUBLIC COMPANY LIMITED, RAYONG GAS SEPARATION PLANT
GSP OPTIMAL FUEL GAS NETWORK PROJECT

555 Sukhumvit Road, Map Ta Phut
Muang, Rayong 21150 Thailand
Attention: Mr. Sahapong Nopcharoen
Project Manager
Email Address: sahapong.n@pttplc.com
Telephone: +66 81 255 9753

Attention: Mr. Teerayut Nimnuy
Project Engineer
Email Address: teerayut.n@pttplc.com
Telephone: +66 84 407 5469

Bidders should direct all communicating to PTT. Communication with PTT in PTT's bid evaluation, bid comparisons or
Contact award decisions may result in the rejection of the Bidder's bid.

(3.6) Acknowledgement



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Within two (2) weeks after collecting the TOR, Bidder shall return by the Acknowledgement Letter included as Attachment 1. It should be typed on Bidders' own letterhead.

(3.7) Interpretation and Clarification of TOR

It is the responsibility of the Bidder to advise PTT of any discrepancies, errors or omissions in the TOR that need to be resolved to enable the Bidder to have a clear understanding of the TOR. Failure to do so is at the sole risk of the Bidder and no relief will be given by PTT for any errors and omissions.

If Bidder has questions concerning any technical or commercial matters, he shall request interpretations or clarifications in writing. Only questions received before two weeks of bid submission will be replied to.

Any response by PTT to a question will be in the form of a question and answer and will be distributed to all Bidders in order to keep the Bid on a comparable basis, without releasing the identity of the original Enquirer. All information contained in this reply shall be deemed to form part of the TOR.

As necessary, addenda to the TOR will be issued.

Bidder's Bid shall be in full conformity with the requirements set out in this Invitation to Bid. Clarifications, deviations, exceptions, exclusions, conditions, variations, assumptions, etc. in Bidder's proposal shall be considered as deviations from the Invitation to Bid.

Where Bidder's Bid contains no specific mention of deviations from the Invitation to Bid, the Bidder shall be deemed to accept the terms, conditions, and requirements of said documents.

(3.8) Site Visit and Pre-Bid Conference

Bidders is required to attend a pre-bid conference and site visit for further explanations or conduct SITE Examination at the GAS SEPARATION PLANT, Map Ta Phut, Rayong. The pre-bid conference and Site visit will be the only meeting for the Bidder with PTT to Bid Submission. The purpose is to enable the Bidders to acquaint themselves with all matters that may affect the Bid. The bidders shall take responsibility for all expense (traveling cost to the plant, accommodation, etc.) in order to visit site.



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After the Site visit and pre-bid conference the Bidder shall be deemed to have fully informed himself on the SITE conditions, the means of access, the possibilities of accommodation and other matters which may influence the Bid. Any lack of knowledge of local matters will not relieve the Bidder from his obligations and responsibilities regarding his Bid or any subsequent AWARD OF CONTRACT.

For Site visit, not more than four (4) representatives from each Bidder will be allowed on the Site visit or at the pre-bid conference. The Bidders must confirm by a letter of the representatives including full name, position and a copy of ID card or passport at least seven (7) days before the site visit. The representative has to come on time in order to attend the safety training program at safety training room in the plant about 2 hours before visit site.

Bidder shall submit in writing not later than 3 days before the visit any queries he intends to raise during the pre-bid conference. He should also advise any specific points regarding the SITE that he wishes to inspect. The questions and responses will be summarized after the pre-bid conference and distributed to all Bidders and become part of the TOR. Bidder's personnel is permitted to enter PTT's premises during the Site visit only on the condition that PTT accepts no liability with respect to the Site visit and that the Bidder retains full responsible for any injury, loss or damage to his personnel.

Failure to comply with all requirements shall have the following consequences:

(3.8.1) Where the Terms of Reference specify the consequences of non-conformity with such requirement, Bidder shall be bound by such consequences, which may preclude Bidder from submission of a bid proposal.

(3.8.2) Where the Terms of Reference does not specify the consequences of non-conformity with such requirement, Bidder retains the right to submit a bid proposal and is taken to have accepted and understood all particulars and the SITE without reservation.

(3.9) Ownership of Documents and Confidentiality

The TOR and all copies thereof remain the property of PTT and shall be promptly returned upon PTT's request. All information contained in the TOR or issued by PTT on its behalf in the course of bidding shall be treated as strictly confidential by the Bidder and shall only be used for the preparation of the Bid.



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Bidder is reminded that he has entered into secrecy agreements as Attachment 3.2.2 with PTT in respect of this bid.

(3.10) Amendment of Bidding Documents

(3.10.1) At any time prior to the deadline for submission of bids, PTT may amend the bidding documents by issuing Addenda.

(3.10.2) Any Addendum thus issued shall be part of the bidding documents pursuant to TOR and shall be communicated in writing or by email or by facsimile to all Bidders of the bidding documents. Prospective bidders shall promptly acknowledge receipt of each Addendum by cable to the Employer.

(3.11) Submission of Bid

(3.11.1) Proposal shall be clearly marked as follows:

“CONFIDENTIAL”

“GSP OPTIMAL FUEL GAS NETWORK PROJECT”

“PRICED COMMERCIAL PROPOSAL” or “UNPRICED COMMERCIAL PROPOSAL”

Or “BID SECURITY” or “PROJECT EXECUTION PROPOSAL” or “TECHNICAL PROPOSAL”

“ORIGINAL” or “COPY”

(3.11.2) The Bid shall be addressed and submitted to

PTT PUBLIC COMPANY LIMITED, RAYONG GAS SEPARATION PLANT

GSP OPTIMAL FUEL GAS NETWORK PROJECT

555 Sukhumvit Road, Map Ta Phut

Muang, Rayong 21150 Thailand

Attn: MR. SAHAPONG NOPCHAROEN

Project Manager



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(3.11.3) Failure to submit any of documents shall lead to rejection of the Bid unopened.

(3.11.4) The Bid shall be delivered to the above address by Bidder's authorized representative on Bid Submission Date between 09:00 a.m. to 03:00 p.m. Bids received outside this time period at the above address will not be considered and returned unopened.

4. Bid Submission

- 4.1 Bidder shall fill the unit price or price of each item as well as the total price in the original Bid form issued by PTT or the quotation form of Bidder which shall have the contents in accordance with the Bid form issued by PTT, which shall include, but not be limited to, date of quotation, name of Bidder, subject of quotation, unit price or price of each item and the total price, and the wordings stating that Bidder shall comply with the terms and conditions of PTT. The Bidding Price shall exclude value added tax, be in THB or USD or EURO or YEN, cover all expenditures incurred until delivery. The amount in number and word shall clearly be stated. Any deletion or correction shall be initialed by the authorized person and affixed with an official seal (If any). Where the unit price or price of each item is inconsistent with the total price, or there is discrepancy between the "number" and "word", then, the provisions of the Civil and Commercial Code shall govern such inconsistency or discrepancy. Bid shall be valid for a period as determined by PTT. Unless otherwise determined by PTT, Bid shall be valid for a period of not less than 90 days as from date after the day of the Bid submission or according to conditions determined by PTT and upon the Bidder irrevocably submitting bid documents according to Clause 3 and may not be withdrawn.
- 4.2 Upon the expiry of submitting the proposal and bidding, the submission of proposal and bidding to PTT is forbidden.
- 4.3 PTT procurement committee will check the qualifications of the bidder, (1) if the bidder has a joint benefit with other bidders. In the event, the bidders have a joint benefit with other bidders, they shall be disqualified from the procurement. (2) PTT shall verify bidder's qualification by using reliable sources in accordance with international standards based on transparency and fairness. In the event that the bidder fall into any prohibited



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characteristics (Blacklist) as per clause 2.2, the procurement committee reserves the right to reject the proposal from those bidders.

5. Bid Security

Bidder is not required to place Bid Security.

6. Bid Evaluation Criteria

- 6.1 For the consideration of this bidding submitting, PTT will consider by using the rules on price
- 6.2 Bidder who won the auction
PTT will consider from Lowest total price.
- 6.3 In the event the bidder does not qualify as per clause 2, the evidences submitted are incorrect or incomplete as per clause 3 or the price is incorrect as per clause 4, the PTT procurement committee shall not consider the bidder unless the bidder's specification or the purchased products 's price is incomplete or the details are different from the company's conditions which is not an essential matter and does not cause disadvantage to the other bidders or there is a slight error, the PTT procurement company shall consider to ease the disqualification of that bidder
- 6.4 PTT reserves the right to not to ease the consideration of the following bidders;
 - (1) Does not have the name in the list of the people buying or receiving auction documents from PTT
 - (2) Has proposed details that differ from the company's condition which are essential or are a disadvantage to other bidders.
- 6.5 In the event, the bidders have wrongfully proposed for the bidding such as submitting false documents or has appointed an ordinary person or legal entity in his behalf, the company shall revoke the auction and punish the bidder, no matter if the bidder is been chosen or not.

In the event, the bidder has proposed a low price, and it can be determined that the work cannot be operated as per the scope of work, PTT procurement committee will let the bidder submit the clarification together with the evidences to ensure that the work will be complete. If the clarification is unsound, PTT will reject the proposal or



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the price of the bidder. The bidder shall not claim for damages or expenses from PTT. PTT's discretion shall be final

- 6.6 Prior to affixing the signature in the agreement, PTT may revoke the auction if it appears the bidder who won the bidding or who is chosen has joint benefits, has advantage with other bidders, is an obstruction for the competition, mutually represent other bidder or bid officer or it appears that the bidder is wrongfully proposing the bid.

7. Contract and Performance Security

7.1 Successful Bidder chosen by PTT shall contact PTT

(1) In case of the procurement which is not over 10,000,000 (Ten million) Baht or is not required to proceed under PTT conditions to be done in a form of a contract, the Successful Bidder which PTT agrees to perform Purchase shall contact PTT to sign a Purchase Order within the period specified by PTT

(2) In case of the procurement which is above 10,000,000 (Ten million) Baht or is required to proceed under PTT conditions to be done in a form of a contract, successful bidder chosen by PTT shall contact PTT to sign a letter of intent and /or contract (as the case may be) within the period specified by PTT

In the event of non-compliance with the said clause 7.1 (1) or 7.1 (2), PTT shall confiscate the security (if any) If PTT needs to acquire substitution procurement from another person at a higher price, Bidder shall be responsible to pay PTT the difference within 30 days from the day after the date of notice thereof by PTT. PTT also reserve the right to claim any other damages arising therefore.

- 7.2 In execution of a Contract or Work Order, Successful Bidder is required to place the Contractual Guarantee. In the case where the Contractual Guarantee is required and unless otherwise stipulated in the details attached to Work Order, Successful Bidder chosen by PTT (hereinafter called "Contractor") shall submit to PTT, cash or Bank Guarantee or Thai government Bond or PTT Bond or PTT debenture 5percent of the price of the Contract or Work Order (the fraction remaining shall be round up) to ensure the performance of its obligations under Contract/ Work Order. The Contractual Guarantee shall be returned when Contractor has been discharged from all obligations under the Contract/ Work Order.



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- 7.3 Contractor shall be responsible to pay revenue stamp required for the Contract or Work Order at the rate stipulated in the Thai Revenue Code.
- 7.4 In case where Successful Bidder fails to enter into the Contract within the period of time specified by PTT or the Contractor fails to comply with the terms or conditions under the contract without reasonable cause, such person, upon PTT's consideration, will be regarded as abandoner and his name will be removed from the Approved Vendor List of PTT.

8. Delivery

- 8.1 The contractor shall deliver the job to the PTT thirteen times within 630 days (counting continuous everyday), Starting from the date after the CONTRACTOR received a Notice of Commencement of Work. This does not include the period during which PTT is not allowed to work or order work stoppages.
- 8.2 The delivery term is DDP at PTT Rayong Gas Separation Plant AS PER INCOTERMS 2020.

9. Place of delivery

The contractor shall deliver the job at the PTT Rayong Gas Separation Plant, 555 Sukhumvit Road, Mab Ta Phut, Muang, Rayong 21150.

10. Payment

- 10.1 PTT shall make the payment
- 13 times to the contractor on the thirtieth (30th) days after PTT's Acceptance Committee has accepted the service successfully
- 1st Payment: 5% of the price of the Contract after PTT approves the execution plan, safety plan, environmental plan, quality plan, coordination procedure and permit plan
- 2nd Payment: 5% of the price of the Contract after PTT approves Engineering details for Process and Mechanical



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3rd Payment: 5% of the price of the Contract after Contractor displays purchase order evidence for Long Lead Equipment Lot 1. There are regeneration gas coolers, refrigerant suction drums, refrigerant condensers and desuperheaters.

4th Payment: 5% of the price of the Contract after Contractor displays purchase order evidence for Long Lead Equipment Lot 2. There is Advanced Oxidation Package.

5th Payment: 5% of the price of the Contract

- Completed Site Preparation
- Approval by PTT of Engineering details for Civil & Steel Structure for Main Equipment (Regeneration Gas Compressor GSP2 and GSP3, Refrigeration Gas Compressor, Gas Coolers, Refrigeration suction drums, refrigerant accumulator)

6th Payment: 10% of the price of the Contract after receiving Piping Material size 3 inches and above.

7th Payment: 15% of the price of the Contract after PTT accepts equipment handover for all Long Lead Equipment Lot 1 (regeneration gas coolers, refrigerant suction drums, refrigerant condensers and desuperheaters)

8th Payment: 10% of the price of the Contract after PTT accepts equipment handover for all Long Lead Equipment Lot 2 (Advanced Oxidation Package)

9th Payment: 10% of the price of the Contract after Completed Mechanical Completion & Performance Test Run for Regeneration Gas Compressor GSP2

10th Payment: 10% of the price of the Contract after Completed Mechanical Completion & Performance Test



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Run for Regeneration Gas Compressor GSP3

11th Payment: 10% of the price of the Contract after Completed Mechanical Completion & Performance Test

Run for Refrigeration Gas Compressor

12th Payment: 5% of the price of the Contract after Completed Mechanical Completion & Performance Test Run for CWWTP's Work Package

13th Payment: 5% of the price of the Contract after Initial Acceptance and Submission of all final documents

Each payment milestone is able to be re-ordered depending on which payment milestone completes first.

10.2 The payment shall be made by bank transfer to the account as designated by contractor.

10.3 Payment shall be subject to deduction of penalty and/or amount disputed.

11. Penalty

If contractor fails to deliver work within the time specified, contractor shall be liable to pay a penalty at the rate of 0.1% (zero point one percent) specified in the contract price for each day of delay. Total delay penalty shall not exceed 10% (ten percent) of contract price in aggregate.

12. Liability

- Liability Notwithstanding the foregoing, CONTRACTOR's maximum liability to PTT (including without limitation liability resulting from breach of contract, tort, negligence, breach of statutory duty, misrepresentation or otherwise for any loss, damage, costs or expenses, or injury ("Damages") sustained by PTT and arising out of or in connection with this Contract) shall respond to all damages but not exceed the total contract value.

Nothing in this paragraph shall exclude or limit the Contractor's liability to PTT for fraud or fraudulent concealment, gross negligence or willful misconduct.



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Quality	Safety	Health	Environment	Lab	Energy

- Consequential Damages Notwithstanding any other provision in this Contract or elsewhere to the contrary, Contractor shall not be liable for any special, incidental, indirect or consequential loss or damage of any nature, arising at any time, from any cause whatsoever, including loss of revenue or profit.

13. Governing LawThe Contract shall be governed by and interpreted in accordance with the laws of the Kingdom of Thailand.

14. Warranty and Guarantee

14.1 The contractor shall warrant its work products for 365 days following the date the PTT's committee has accepted the service successfully in accordance with the conditions set by the PTT.

14.2 The contractor shall deliver the warranty certificate to the PTT with the supplies/ equipment. (if any)

15. Advance Payment

No Advance Payment

16. PTT Supplier Sustainable Code of Conduct) (When the contract having the value from 2 million Baht)

Successful Bidder who agrees to purchase/work/rent , shall accept and conform with the “PTT Supplier Sustainable Code of Conduct” PTT reserves the right to inspect if Bidder is in compliance. With the PTT Code of Conduct.

Vendors who have a plan to run business with PTT must act along PTT regulations and conditions, sustainable practice for PTT groups’ vendors, including:

16.1 Vendors must run firms strictly along involved rules which covered business ethics, social responsibility, security and environment, for example, labor protection law, safety law, and environmental law. Moreover, vendors must run business with transparency, honesty and must not violate the intellectual property rights.

16.2 Vendors must have qualifications related to ESG Interception Criteria including:

(1) Vendors must not be tolerating, permitting, or engaging in bribery, corruption, or unethical practices whether in dealings with public officials or individuals in the private sector.

(2) Vendors must have involved work permits along the defined laws.



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(3) Vendors must not be judged to false in term of financial, environment, security and labor court. Furthermore, vendors must not be found in list of personality, juristic person and company that run business against Thai laws within 3 years before launching the auctions.

(4) Vendors must have firms' policies to will not hire youth labor that age below 15 years old.

(5) Vendors must have enterprises' policies to pay labor's compensation at least the defined legal minimum wage. In addition, vendors must not force employees to work more than the legal defined hours.

(6) Vendors must have SSHE management system in working place along the defined law and concern about employee's safety.

(7) Vendors must have management system of working area and also environmental liability, for instance, the leaking of dangerous substance in soil and underground water.

17. Contractor's performance evaluation

- 17.1 PTT shall evaluate vendors after the completion of the delivery of products/services in each delivery period, based on their work performance.
- 17.2 PTT reserves the right to use the vendor evaluation's result in order to determine the bidder's qualification for the next PTT's bidding.
- 17.3 In the case of any vendors in the PTT Approved Vendor List(PTT AVL) is given graded "D" from the vendor evaluation under a specific type of work, PTT reserves the right to delist such vendors from type of work hereunder. The vendors shall not be permitted to register with PTT AVL under such type of work for at least 3 years from the delisted date.
- 17.4 If the vendor has any queries with regards to the vendor evaluation, the vendor shall submit the request in writing to the procurement unit of PTT for the explanation of such evaluation. The copy of the purchase order/contract and work result must be attached to the request. The vendor can access the system *pttvm.pttplc.com* for the results of vendor evaluation

18. Personal Data Protection



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network		
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Related standard systems		
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Both parties agree to comply with the Thai Personal Data Protection Act and all applicable personal data protection laws including any subsequent amendments, other relevant rules and regulations of the jurisdiction where such party is mandated, in respect of collection, use and/or disclosure of any personal information. In this regard, each party represents and warrants that it has right and authority to disclose any personal information of any third party to the other party and has obtained all necessary consents from the relevant third party to disclose such personal information. Any collection, use and disclosure of personal information hereunder shall be conducted to the extent it is necessarily required for and in compliance with such law(s).

In the event that any performance hereunder of either party is considered to be a data controller or a data processor under Thai Personal Data Protection Act including any amendments, the parties agree to enter into a Data Processing Agreement, Data Sharing Agreement or any other similar documentation to ensure adequate level of data protection as required by law and such document shall be incorporated hereinto.



Privacy Notice

<https://pttpdpa.pttplc.com/Privacy/106107>

19. Scope of Work

1 Definition

The following definitions will apply to the Agreement between the CONTRACTOR and PTT:

- 1.1 “AWARD OF CONTRACT” shall mean the date of the receipt of NOTICE of Award from PTT.
- 1.2 “CERTIFICATE” or “NOTICE” shall mean a notice issued in writing by either PTT or CONTRACTOR according to this CONTRACT.



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Related standard systems		
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- 1.3 “CONTRACT” shall mean this Contract document and the documents referred to herein and attached hereto as Exhibits.
- 1.4 “CONTRACT PRICE” shall mean the lump sum price to be paid by PTT to CONTRACTOR, in consideration for the performance of the WORK under this Contract.
- 1.5 “CONTRACTOR” shall mean who shall be liable (jointly and severally liable, in case of Consortium / Joint Venture) to PTT for any and all obligations and responsibilities under this CONTRACT.
- 1.6 “Day” means calendar day as referred to local time of Thailand.
- 1.7 “EFFECTIVE DATE” shall mean the date referred in the NOTICE OF AWARD from PTT.
- 1.8 “DRAWING” means drawings included or referred to in this Contract and any modification of those drawings approved in writing by PTT and any other drawings, which may from time and time be ordered, furnished or approved in writing by PTT.
- 1.9 “FACILITIES” means the equipment, components, buildings, infrastructure and all other items of a permanent nature so installed and put into operation by CONTRACTOR under this Contract for which a CERTIFICATE of FINAL ACCEPTANCE is issued.
- 1.10 “FINAL ACCEPTANCE” occurs after INITIAL ACCEPTANCE, WORK and completion of the warranty period. It shall be evidenced when PTT issues the CERTIFICATE of FINAL ACCEPTANCE; and the CERTIFICATE OF FINAL PAYMENT AND RELEASE has been issued by CONTRACTOR and endorsed by PTT.
- 1.11 “GSP” means Rayong Gas Separation Plant which facilitates under PTT public Company Limited.
- 1.12 “INITIAL ACCEPTANCE” shall mean that the PERFORMANCE ACCEPTANCE of WORK as attachment 12 has been achieved, respectively liquidated damages have been paid and that the WORK has been completed in accordance with the CONTRACT including



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painting, final clean-up, landscaping, completing of all punch list and etc. and all documentation including “as built” DRAWINGS has been handed over to PTT.

- 1.13 “MECHANICAL COMPLETION” means the state of UNIT when construction is completed and as further defined in Attachment 13.
- 1.14 “NOTICE OF AWARD” shall mean the NOTICE by PTT to the successful Bidder evidencing that he has been appointed by PTT as CONTRACTOR.
- 1.15 “Parent Company” shall mean a company that holds at least twenty six percent (26%) of the paid-up equity capital directly or indirectly in the Bidding Company or in the Member of a Bidding Consortium.
- 1.16 “PERFORMANCE ACCEPTANCE” shall mean the condition achieved when UNIT has achieved READY FOR START UP and has satisfactorily passed the performance tests.
- 1.17 “PERFORMANCE ACCEPTANCE DATE” shall mean the date referred to in the PERFORMANCE ACCEPTANCE CERTIFICATE
- 1.18 “PROJECT SPECIFICATION” means the document entitled Project Specification incorporating the general project information and requirements as agreed between PTT and CONTRACTOR, and any addition or revision thereto made by a Change in the SCOPE OF WORK, and incorporating any documents referenced therein; and the full project specification have been incorporated in this Contract.
- 1.19 “PROJECT EXECUTION PROPOSAL” means the description of CONTRACTOR's methods and procedures to be used in the execution of the WORK as modified, where necessary, and agreed with PTT before AWARD OF CONTRACT, and incorporated in this CONTRACT.
- 1.20 “PTT” means PTT public Company Limited and all legal successors and assignees. PTT reserves the right to assign tasks, in whole or in part, to PTT’s REPRESENTATIVE at any time during the Contract period.



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- 1.21 “PTT’s REPRESENTATIVE” means PTT’s personnel, PTT’s consultant or any third party, whom PTT may authorize in writing from time to time to act on behalf of PTT. However, PTT may execute such power so authorized by itself.
- 1.22 “READY FOR START-UP” shall mean the condition achieved when UNIT has been erected in accordance with the CONTRACT and when pre-commissioning has been completed to the extent to permit UNIT to safely receive feed gas, to handle feed gas at the appropriate design conditions.
- 1.23 “SITE” shall mean the areas where the WORK shall be performed as indicated in the PROJECT SPECIFICATION situated at PTT Gas Separation Plant, Mab Ta Phut, Rayong.
- 1.24 “SCOPE OF WORK” shall mean CONTRACTOR’s SCOPE OF WORK as per Article 19.
- 1.25 “SUBCONTRACTOR” shall mean any person or company to whom the CONTRACTOR has subcontracted any portion of the WORK under this CONTRACT.
- 1.26 “UNIT” shall mean set of COMPRESSOR Unit and CWWTP’s Work Package including with any equipment which specified in SCOPE OF WORK.
- 1.27 “VENDOR” shall mean any supplier to CONTRACTOR of equipment and materials, whether nominated on the VENDOR LIST or not, but shall be approved by PTT.
- 1.28 “VENDOR LIST” shall mean a limited list of VENDORS nominated by CONTRACTOR and approved by PTT for supply of equipment and material items.
- 1.29 “WORK” means any and all design, supply, construction and other WORK and services of and for the UNIT as specified to be furnished by CONTRACTOR under the CONTRACT and the fulfillment of all his obligations thereunder including CHANGES in SCOPE OF WORK.
- 1.30 "COMPRESSOR" means compressor packages consist of Regeneration Gas Compressor GSP2, Regeneration Gas Compressor GSP3 and Refrigeration Gas Compressor.



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Quality	Safety	Health	Environment	Lab	Energy

Words importing the singular include the plural and vice versa. Words denoting the masculine gender include the feminine gender and both shall include the neuter gender.

2 **PROJECT SCOPE OF WORK**

PTT intends to have the completed Engineering Works Package for GSP Optimal Fuel Gas Network Project.

The project includes with:

- 2.1 Providing engineering, procurement, construction, commissioning and related services of main equipment (mechanic, electrical and instrument equipment) piping and facilities of following work packages (WP),

2.1.1 **WP1: HP Flash Gas from GSP6 pipeline to Remaining Gas Treatment (RGT) at GPPP**

New HP flash gas from GSP6 (3601-1/2-T-002) is diverted from being used as LP fuel gas to the Remaining Gas Treatment for blending with the sales gas system.

2.1.2 **WP2: Comprehensive Wastewater Treatment Plant (CWWTP) Modification**

The mainly CWWTP is separated into 3 sub-work order as follows:

- Increase of Dissolved Air Flootation unit (DAF) efficiency
- Installation of new Advanced Oxidation Package (AOP)
- Installation of new Activated Carbon Filter and Carbon Fine Filter at GPPP area

2.1.3 **WP3: Modification for Booster compressor suction pipeline and control system to LP Fuel System for GSP6 and ESP**

Based on the original design, fuel gas being used in the ESP and GSP6 is taken from the discharge of the Sales Gas Compressor. However, for



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Quality	Safety	Health	Environment	Lab	Energy

energy saving, the fuel gas can be taken from the suction Residue Gas Booster Compressors (3203-C-001 and 3603-C-001). The new 8" Residue gas line with pressure control valve shall be provided.

2.1.4 **WP4: New Refrigeration system for Remaining Gas Treatment (RGT)**

Based on the current operation of the existing remaining gas system, the refrigerant used for Remaining Gas Cooler (5590-E-004) is supplied from GSP3. However, to provide more flexibility, a new refrigeration system is provided.

2.1.5 **WP5: New Regeneration Gas Compressor systems for GSP2 and GSP3**

The new Regeneration Gas Compressors shall be provided at GSP2 and GSP3. The compressors will be used for sending the regeneration gas to the sales gas header.

- 2.2 Refer to WP4 and WP5, Contractor shall install and commissioning Regeneration Gas Compressor GSP2, GSP3 and Refrigeration Gas Compressor Skids (3 Skids) which is supplied by PTT. The Compressor skid composed of equipment such as compressor and accessories, medium voltage motor and starter (liquid rheostat), lube oil skid, seal gas system, anti-surge valve, UCP, Anti-surge controller, Local instrument, Oil Cooler package as attachment 7.
- CONTRACTOR shall supply and install piping from COMPRESSOR to PTT utility such as cooling water, instrument air, nitrogen
- 2.3 Relocate instrument air tank of GSP2 including field instrument equipment.

3 SCOPE OF WORK

3.1 Division of Responsibility

This section of the project SCOPE OF WORK summarizes the CONTRACTOR's WORK



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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MR. SAHAPONG NOPCHAROEN

MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

and the division of responsibilities between CONTRACTOR and PTT for the PROJECT.

Scope of Work	CONTRACTOR	PTT
COMPRESSOR - Compressor Skid - Main Motor and Starter - UCP - Lube Oil and Dry Gas Seal Skid - Anti-Surge Valve and Anti-Surge Controller	-	X
Engineering Design Verification	X	-
Detailed Engineering	X	-
Procurement & Supply	X	-
Temporary FACILITIES and Laydown Areas	X	-
Site Preparation	X	-
Construction	X	-
Equipment Installation	X	-
Pre-commissioning	X	-
Commissioning and initial operation through to INITIAL ACCEPTANCE	X	-
X means included - means excluded		



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Quality	Safety	Health	Environment	Lab	Energy

Remark: For construction and commissioning work, PTT requests CONTRACTOR to work under VENDOR's supervisor of main equipment such as compressor, MV motor, UCP, anti-surge control, DCS and Safety PLC, AOP Package. All cost for VENDOR's supervisor since construction until finishing commissioning shall be responsible by CONTRACTOR.

3.2

3.3 Scope of CONTRACTOR's WORK

The responsibilities of CONTRACTOR shall include the following:

3.3.1 Project Management

Carry out overall project coordination and management.

3.3.2 Engineering

PTT have established the basis of design to the extent shown in Attachment 4 Technical Information. CONTRACTOR shall keep in mind that all of the establishments are only minimum requirements of the Project and shall be developed further to fulfill the Complete SCOPE OF WORKs. The engineering information which PTT's have established is only the preliminary design. The CONTRACTOR shall not deny the responsibility to fulfill until complete SCOPE OF WORKs.

The report of compressor performance shall be prepared and issued after commissioning period.

CONTRACTOR shall verify and prepare the foundation analysis in order to avoid any effect from any vibration.

CONTRACTOR shall verify, refine and optimize the basic design presented in Attachment 4 Technical Information and generate all such architectural, civil, structural, mechanical, process, instrument, electrical



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and other engineering and design data that are not covered in the TOR, but are required to complete the design and detailed engineering of all works. CONTRACTOR shall carry out the design verification and detailed engineering in accordance with the PROJECT SPECIFICATION, and in particular complying with the requirements of PTT's engineering standards, with the objective of providing a complete, efficient, operable and safe UNIT. CONTRACTOR'S engineering WORK shall cover all the WORK and include but shall not be limited to the preparation of all necessary documents and DRAWINGS, such as flow schemes, data/requisition sheets, specifications, requisitions, instructions, detailed DRAWINGS, reports and calculations.

PTT shall have the right to check engineering and design and to monitor the progress, including physical progress of CONTRACTOR, to verify that CONTRACTOR is executing the WORK in a responsible manner and in accordance with the PROJECT SPECIFICATION and agreed schedule.

3.4 Procurement

CONTRACTOR is responsible for the procurement, supply, inspection and delivery to SITE of all equipment and materials required for the UNIT to meet the schedule. CONTRACTOR shall provide expediting, inspection, tests and quality control at manufacturer's shops and on SITE. CONTRACTOR is responsible for the importation into Thailand in PTT's name, package, ship, receive, unload and store equipment and materials including BOI Terms and Conditions (if applicable), Customs clearance and payment of import duty and associated taxes, where such equipment and material are sourced from outside Thailand.

PTT will monitor all procurement activities except for price related matters to verify that



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procurement is being carried out in accordance with the CONTRACT, the PROJECT SPECIFICATION and the schedule.

3.5 Construction

CONTRACTOR is responsible for all WORK related to the construction of the UNIT described in this PROJET SPECIFICATION and the provision of temporary FACILITIES. CONTRACTOR shall arrange for the attendance of VENDOR's personnel to advise on installation and commissioning including assist in the preparation of construction punch lists and undertake final inspection of the new process unit to ensure compliance with VENDOR' requirements and maintain the validity of VENDORS' performance guarantees assigned to CONTRACTOR. CONTRACTOR shall provide temporary SITE FACILITIES for construction and office accommodation for their own, and for PTT's REPRESENTATIVEs. CONTRACTOR shall provide earthworks, piling, concrete works and foundations, steel structures, buildings, paving, fences and landscaping and shall provide all work, equipment, tools, materials, labour, supervision and all services required to construct the UNIT.

PTT will monitor the construction of the UNIT to verify that construction is being carried out in accordance with PROJECT SPECIFICATION and schedule. The Contractor shall take responsibility to prevent any incident (such as compressor high vibration) during construction and erection at the Plant area in order to ensure no any interruption or interfere the normal operation of Plant.

3.6 Pre-Commissioning and Commissioning

3.6.1 CONTRACTOR is responsible for pre-commissioning of the UNIT and shall provide all temporary connections and interim systems required for



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Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

pre-commissioning, commissioning and performance test runs.

CONTRACTOR shall carry out pre-commissioning, start-up and initial operation including performance test runs up to the issue of the INITIAL ACCEPTANCE CERTIFICATE.

CONTRACTOR shall arrange for the attendance of VENDORS' personnel to assist in pre-commissioning and commissioning of the process units in accordance with agreements in Performance Tests Run and PERFORMANCE GUARANTEE.

3.6.2 CONTRACTOR is responsible for Commissioning of the UNIT in accordance with the Commissioning Plan developed by CONTRACTOR.

3.6.3 COMMISSIONING will be undertaken by CONTRACTOR following issue of the READY FOR START-UP CERTIFICATE of each sub-division of the UNIT according to the Commissioning Plan. This plan will be subject to approval by PTT.

3.6.4 During the Commissioning period, CONTRACTOR's services shall be provided in accordance with the requirements set out in DEFINITION OF COMPLETION and will include:

3.6.4.1 Provision of all management, supervisory and operations personnel required for commissioning through to INITIAL ACCEPTANCE.

3.6.4.2 Representatives of VENDORS in accordance with VENDORS' recommendation for the duration of commissioning and performance testing activities associated with the new process units.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

3.6.4.3 Sufficient supervision, labor, plant and materials for correction of any defects in the UNIT. These services shall be maintained on SITE up to INITIAL ACCEPTANCE.

3.6.4.4 Recording and reporting on all commissioning and performance testing activities though to INITIAL ACCEPTANCE.

3.6.5 Operation of the UNIT until INITIAL ACCEPTANCE, including Performance Tests, shall be CONTRACTORS's responsibility.

3.7 Consumables

3.7.1 CONTRACTOR shall provide all utilities and consumables, for example fuel gas, refrigerant, electricity, lubricants, greases, chemicals necessary to perform the WORK. This includes all utilities and consumables up to issue of CERTIFICATES of PERFORMANCE ACCEPTANCE.

3.7.2 CONTRACTOR shall provide initial fillings up to INITIAL ACCEPTANCE plus make-up to normal levels after achievement of PERFORMANCE ACCEPTANCE. Any make-up before Achievement of PERFORMANCE ACCEPTANCE is considered commissioning make-up and shall be supplied by CONTRACTOR. Make up after Achievement of PERFORMANCE ACCEPTANCE shall be considered operational make-up.

3.8

3.9 Final Clean Up

Remove equipment, tools, waste materials, temporary structures and surplus material to



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

MR. TEERAYUT NIMNUY

MR. SAHAPONG NOPCHAROEN

MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

leave the Plant area in a clean operable condition.

3.10 **Operating Manuals**

Compile all data and information required for operating and maintaining the UNIT including normal operation, start-up, normal shutdown and emergency operations.

3.11 **Training**

CONTRACTOR shall provide both theoretical and practical training for PTT personnel as following.

TENTATIVE TRAINING PROGRAM

Description				Number of courses (Online or Onsite Training)	Number of participant per course	Note
	Operation	Maintenance	Engineering			
Process / Operation	/	-	-	1	20	1, 2
Surge Control System (O&M Course)	/	-	-	1	20	1, 2
PLC (UCP)	-	/	/	1	10	1, 2
Driver / Compressor	/	/	/	1	20	1, 2



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

MR. TEERAYUT NIMNUY

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MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

/ Lube Oil System						
AOP Package	/	/	-	1	20	1, 2

NOTE

- 1) Instructors shall be from Equipment VENDOR representative (from training department, field representative is not acceptable)
- 2) Training can be carried out online or at PTT facility. Contractor shall provide training instructor (s), media, material, handout, PC, tea break and lunch break by without any additional cost.

General Note

- 1) PTT reserves the right to record the training course via video for future training.

3.12 Spare Parts and Spare Materials

CONTRACTOR shall provide spare parts and spare materials as follows:

- All spare parts for construction, pre-commissioning, commissioning, and start-up.
 - Recommendation only for spare parts for 2 years operation from INITIAL ACCEPTANCE including detailed price lists. 2 Years spare part shall refer to ES-99.05 Spare Part.
- Spare Parts Price shall be valid for a period of not less than 18 months as from date after the day of the Bid submission.

3.13 Maintenance Equipment

Provide tools for maintenance, at least as specified.

- Engineering Notebook one (1) unit with engineering software license for PLC of AOP Package.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

3.14 Documentation

Provide all documents in the “as-built” status in sufficient detail to enable PTT in the future to operate, maintain, repair or expand the UNIT.

All engineering drawings shall be handed over in native format and pdf format.

3D model of project shall be hand over in native format.

All engineering settings, configurations or programs in MCC Switchgear, PLC, etc. shall be hand over in native format.

3.15 Service Agreement

Arrange service agreements with suppliers of major equipment such as compressors, motor, instruments, electric FACILITIES etc.

For construction and commissioning work, PTT requests CONTRACTOR to work under VENDOR’s supervisor of main equipment such as compressor, MV motor, UCP, anti-surge control, DCS and Safety PLC, AOP Package. All cost for VENDOR’s supervisor since construction until finishing commissioning shall be responsible by CONTRACTOR.

3.16 Assistance in Obtaining Approvals and Permits

Assist PTT in obtaining approvals by government authorities or agencies in Thailand and in the preparation of the environmental impact statement.

CONTRACTOR's responsible for Application fees, Document preparation, Document submission, Document signed by engineers and Others that are relevant.

List of Permits is shown below,

- (1) ใบอนุญาตประกอบกิจการ โรงงาน/ขยายโรงงาน ร.ง. 4
- (2) ใบอนุญาตทางสิ่งแวดล้อม
- (3) ใบอนุญาตก่อสร้างอาคาร (อ.1)
- (4) ใบรับรองการก่อสร้างอาคาร ดัดแปลงอาคาร หรือเคลื่อนย้ายอาคาร(แบบ อ.6)
- (5) BOI



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

(6) รายการใบอนุญาตอื่น ๆ ตามที่กฎหมายกำหนด

If the project is under BOI approval, CONTRACTOR shall also assist PTT in preparation of the BOI Equipment Master List and provide necessary support until it is approved by BOI.

3.17 Other Services

CONTRACTOR shall supply all administrative and other services required to complete engineering, procurement, supply of equipment and materials, construction, pre-commissioning, commissioning and testing. This shall include the provision of services to PTT as specified herein including preparation of all necessary documentation including providing draft application letters on behalf of PTT to enable all licenses and permits as required to be obtained by PTT.

3.18 Scope of PTT's Supply for Compressor Packages

CONTRACTOR shall be responsible for install and commissioning under VENDOR's Supervisor for the equipment which PTT supply in Compressor Package as in Attachment 7. CONTRACTOR shall verify every detail in Attachment 7. In the event that CONTRACTOR identifies a discrepancy within the PROJECT SPECIFICATION, he will refer this to PTT for resolution.

3.19 Scope of PTT's Services

PTT is responsible for monitoring the progress and performance of CONTRACTOR in the execution of the WORK. PTT has employed the services of a Engineering and Inspection Firm which will act as an CONSULTANT, to assist PTT in performing this role on behalf of PTT. CONTRACTOR shall accept all decisions made by CONSULTANT as if they are made by PTT.

PTT will explain and clarify to CONTRACTOR any points arising from this PROJCT SPECIFICATION during project execution.

PTT is the final arbiter on proposed modifications or additions to this PROJECT



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

SPECIFICATION. PTT will review certain items of the WORK and may carry out this function by means of a team resident in CONTRACTOR's office(s) with back up resources in his home office as necessary.

In the event that CONTRACTOR identifies a discrepancy within the PROJECT SPECIFICATION, he will refer this to PTT for resolution.

3.20 Completion and Transfer of the UNIT

PTT will apply for the licenses and permits as required for the PROJECT, but it shall be CONTRACTOR's responsibility to prepare all necessary documentation including draft application letters.

All other licenses or permits required for the WORK including work permits, temporary FACILITIES, utilities, land, telecommunications, etc. shall be obtained by CONTRACTOR from the relevant Authorities.

CONTRACTOR shall be responsible for all activities relating to the UNIT until INITIAL ACCEPTANCE. Upon signature by PTT of the INITIAL ACCEPTANCE CERTIFICATE, care and custody of the UNIT passes from CONTRACTOR to PTT. All other obligations of CONTRACTOR under the CONTRACT continue until FINAL ACCEPTANCE.

3.21 Warranty Period

In order to coordinate the resolution of any problems that may appear during warranty period. PTT requires that CONTRACTOR designates a single point responsibility for liaison with PTT. Any apparent defects in all parts or equipment which define in the SCOPE OF WORK will be reported to that representative, who will be responsible for obtaining prompt responses from CONTRACTOR, VENDORS or SUBCONTRACTORS as relevant: he will also be available to attend any plant inspections and witness on CONTRACTOR's behalf.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

Warranty of Compressor Package Installation is the responsibility of the CONTRACTOR.
 CONTRACTOR shall correct or fix the problems if it is proven that caused by installation.

4

PROJECT SPECIFICATION**4.1 REQUIREMENTS FOR CONTRACTOR'S COORDINATION PROCEDURE****4.1.1 Project Organization**

4.1.1.1 CONTRACTOR shall have adequate field organization and qualified manpower to undertake the work.

Experience of qualified manpower shall meet requirements in related field as shown below,

4.1.1.1.1 Project Manager shall be CONTRACTOR's permanent staff and have experience more than 15 years.

4.1.1.1.2 Lead Civil Engineer shall have experience more than 10 years and have certificate of Professional Engineering License in Civil Engineering.

4.1.1.1.3 Lead Electrical Engineer shall have experience more than 10 years and have certificate of Professional Engineering License in Electrical Engineering.

4.1.1.1.4 Lead Instrument Engineer shall have experience more than 10 years.

4.1.1.1.5 Lead Mechanical Engineer or Piping Engineer shall be CONTRACTOR's



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

permanent staff and have experience more than 10 years and have certificate of Professional Engineering License in Mechanical Engineering.

4.1.1.1.6 Lead Process Engineer shall have experience more than 10 years and have certificate of Professional Engineering License in Chemical Engineering.

Requirement for each level of professional license shall be in accordance with The Council of Engineers Thailand (COET) Regulation.

PTT have right to change Project Manager if the project progress delays more than 10%.

In case that CONTRACTOR change key personel staff from above positions, PTT has the right to qualify new personel staff.

4.1.1.2 CONTRACTOR shall, within 1 month of AWARD OF CONTRACT, prepare and issue a coordination procedure



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems

☒ Quality

☐ Safety

☐ Health

☐ Environment

☐ Lab

☒ Energy

for the CONTRACT. It shall incorporate all requirements of this document or agreed alternatives, which have been incorporated in CONTRACTOR's approved PROJECT EXECUTION PROPOSAL. The coordination procedure shall cover all channels of communication between CONTRACTOR and PTT/CONSULTANT, in all relevant locations. It shall specify the administrative, correspondence and other CONTRACT procedures operative between the participants, and establish the functional relationships and limits of authority of all parties.

- 4.1.1.3 CONTRACTOR shall appoint an experienced Project Manager responsible for WORK under the CONTRACT. He shall be manager of all the CONTRACTOR's internal efforts with full authority to implement all actions necessary for the proper and expeditious execution of the CONTRACT. A delegation of responsibilities is allowed if the WORK is being performed at various locations. In this case, the authorization is limited to the specific WORK being executed at that location, e.g. the resident construction manager will be responsible for the SITE activities. In addition, CONTRACTOR shall nominate his key personnel, all of whom shall remain for the duration of the CONTRACT, unless otherwise requested or approved by PTT/CONSULTANT. These key personnel



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

shall include process design, engineering, procurement, project control, construction, quality assurance, commissioning coordinators, SHE Manager and other SHE Specialists who shall be able to act as contacts for their respective specialties. PTT/CONSULTANT may, at his discretion, appoint coordinators to act as contacts for CONTRACTOR's coordinators.

- 4.1.1.4 CONTRACTOR's coordination procedure shall contain an organization chart, showing the interrelationships between his project personnel.

4.1.2 Authority,

CONTRACTOR shall include in the coordination procedure lists of personnel authorised to sign on his behalf, correspondence addressed to PTT/CONSULTANT. It is anticipated that several levels of authority will be required to execute the WORK efficiently. Letters and facsimile transmissions shall generally be signed by CONTRACTOR's Project Manager or his nominated deputies as applicable. Document transmittal letters shall generally be signed by the relevant Project Manager, the appropriate discipline coordinators or their nominated deputies.

4.1.3 Communications

- 4.1.3.1 The execution of the WORK shall require communications between PTT, his representatives and CONTRACTOR.
- 4.1.3.2 Communications shall generally be made by email. For expediency, other telecommunications (telephone or



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems

☒
Quality

☐
Safety

☐
Health

☐
Environment

☐
Lab

☒
Energy

email) may be used, however these communications shall be immediately confirmed by letter or email.

If facsimile is used to transmit urgent communications then sender shall request confirmation of receipt from recipient.

4.1.3.3 Documents and Drawings Distribution shall generally be made by electronic transmittal in PTT CONZOL (Engineering Document Management System). For expediency, other telecommunications (telephone or email) may be used, however these communications shall be immediately responded by PTT.

4.1.3.4 CONTRACTOR and PTT shall maintain a complete indexed record of all incoming and outgoing numbered correspondence, and shall advise the originator to resend any correspondence not received. This shall be done on a weekly basis.

4.1.3.5 Notes of Meeting shall be issued under their own identification number.

4.1.4 Abbreviations

CONTRACTOR's coordination procedures shall include lists of abbreviations permitted in communications between CONTRACTOR and PTT. (e.g. PFD – Process Flow Diagram).

4.1.5 Progress Reports

CONTRACTOR shall issue weekly and monthly progress reports and



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

update in PTT CONZOL (Engineering Document Management System).

4.2 ENGINEERING EXECUTION REQUIREMENTS

4.2.1 Introduction

CONTRACTOR shall perform his engineering WORK in accordance with the CONTRACT and this PROJECT SPECIFICATION. PTT reserves the right to carry out random technical audits of the WORK being performed by the CONTRACTOR. Such audits may review WORK that is either completed or in progress and may take the form of documentation reviews or discussion/interview with those carrying out the work.

CONTRACTOR shall comply with the requirements of this section, and the PTT's Engineering Standards.

4.2.2 Design Policy

4.2.2.1 CONTRACTOR shall ensure that the UNIT is functional, and that construction, operation, and maintenance of the UNIT can be conducted safely and efficiently.

4.2.2.2 CONTRACTOR is responsible for ensuring that all engineering and design performed by VENDORS and SUBCONTRACTORS meets the requirements of the PROJECT SPECIFICATION, including review/approval of design calculations and fabrication details governing UNIT and EXISTING FACILITIES integrity.

4.2.2.3 CONTRACTOR's design shall ensure the safety of personnel and equipment during engineering, construction, commissioning, operation, maintenance and



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

disinvestment. In particular, safe starting, safe operation and safe shutdown of the UNIT and EXISTING FACILITIES shall be ensured at all times and under all conditions. Safe shutdown also includes those features required to ensure that safe conditions are maintained after the actual shutting down of part or all of UNIT.

4.2.2.4 CONTRACTOR's design must ensure the most economic usage of utilities, fuel and energy

4.2.2.5 Equipment and materials shall be designed in such a manner that the variety in manufacturers and type minimizes capital investment for stock of spare parts. Consequently, CONTRACTOR shall aim at selecting single manufacturers for similar groups of equipment such as pumps, compressors, air coolers, simple shell and tube exchangers, etc.

4.2.2.6 CONTRACTOR is responsible for ensuring that all engineering, procurement, construction, commissioning and other documentation produced by CONTRACTOR is consistent in content, approach and numbering systems across the CONTRACT. CONTRACTOR shall be required to use PTT's numbering system. (Refer to Engineering Standard ES 99.01 Numbering System). Further CONTRACTOR is responsible for ensuring that all documents produced by VENDORS and SUBCONTRACTORS meet the minimum requirements



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

for presentation required by the Engineering Standards.

4.3 Preparation of Design and Engineering Document

4.3.1 General

CONTRACTOR's design and engineering work shall include but not be limited to the preparation of all necessary documents including procedures, plot plans, flow diagrams, data sheets, specifications, requisitions, construction DRAWINGS, piping isometrics, reports, calculations, etc., within the scope of his work as is required:

- To ensure smooth and uninterrupted execution of the CONTRACT within the schedule e.g. engineering, procurement, construction and commissioning.
 - To fulfill the requirements of the PROJECT SPECIFICATION.
 - To fulfill the requirements of local law and statutory authorities.
 - To fulfill the requirement of project SHE Management Plans and Permitting requirements.
 - To be in line with internationally accepted sound engineering practice.
 - To complete the PROJECT RECORD.
 - To provide PTT with sufficiently detailed instructions and records of the new FACILITIES to allow safe and efficient operation and maintenance of the UNIT together with the EXISTING FACILITIES.
- Thai law requires certain engineering documents to be approved by Thai registered engineers. CONTRACTOR shall include such approvals in his scope, at his cost.
- PTT believes that all engineering documents of EXISTING FACILITIES



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

supplied to CONTRACTOR are correct and have been developed to show the current as built status. However, PTT/CONSULTANT accepts no liability for any errors in the DRAWINGS and recommends that CONTRACTOR check DRAWINGS as appropriate to confirm the as built status

4.3.2 Language on Documents

The English Language shall be used on all documents and DRAWINGS. Documents required for statutory authorization shall be made in the language required by the authorities as well as in English.

4.3.3 Standard Forms

CONTRACTOR shall use standard forms where required by the Engineering Standards or where provided or referenced in the PROJECT SPECIFICATION. If no specific requirement is stated in the PROJECT SPECIFICATION, CONTRACTOR shall submit to PTT/CONSULTANT copies of all of his standard forms for PTT review.

CONTRACTOR shall develop standard title blocks, DRAWING frames, document front sheets, etc., for the CONTRACT. These shall be subject to PTT's approval prior to use, and shall be similar to those used in the PROJECT SPECIFICATION.

4.3.4 Symbols on DRAWINGS and schemes

The symbols and identifications to be used on DRAWINGS and flow diagrams shall be in accordance with the Engineering Standards.

Where no suitable symbol is defined within the Engineering Standards and no recognized international symbol exists or there is ambiguity, then



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

CONTRACTOR shall discuss with PTT to determine mutually acceptable symbol.

4.3.5 Draughting Practices

Requirements for the preparation and execution of DRAWINGS, paper sizes, print sizes and draughting practices shall be in accordance with Engineering Standards.

4.3.6 Units of Measurement

The International System of Units (SI Units) shall be used on all design and engineering documents and DRAWINGS as amended in Project Standard 0504.05-ES-99.00.05 : Basic Engineering Design Data and/or as required by the authorities.

4.3.7 Engineering Standards

CONTRACTOR shall comply with the PTT's Engineering Standards and shall refer to PTT any conflict between any standards, standard DRAWINGS, codes or specifications and any conflict between Engineering Standards and local law, statutory or government regulations and codes. CONTRACTOR shall also propose any modifications to the Engineering Standards, which may be necessary to comply with such laws, regulations and codes but shall obtain PTT written approval before proceeding with such modifications.

4.3.8 Confidentiality of Standards

The PROJECT SPECIFICATION may only be divulged to third parties such as VENDORS or SUBCONTRACTORS, as permitted by CONTRACTOR's Secrecy Agreements with PTT, or as permitted by secrecy agreements enacted for the purposes of this CONTRACT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

Where such information is divulged to a third party then the CONTRACTOR shall have similar Secrecy Agreements with that third party. Copies of all Secrecy Agreements shall be transmitted to PTT.

4.4 Status and Review of Documents **Refer ES-99.01

4.4.1 Status Indication of DRAWINGS and Requisitions

All documents and DRAWINGS issued by CONTRACTOR shall be clearly marked or stamped to indicate their status, e.g.:

- FOR INFORMATION
- FOR COMMENTS
- FOR APPROVAL
- APPROVED FOR DETAILED ENGINEERING
- APPROVED FOR CONSTRUCTION
- AS BUILT

All DRAWINGS issued at, and after the "For Approval" stage shall include a "List of Holds" to identify any information on the DRAWING which is not firm. This list of holds shall appear on the body of the DRAWING and not as a separate sheet.

CONTRACTOR shall ensure that holds are removed from DRAWINGS quickly. In the event that a DRAWING is issued "APPROVED FOR CONSTRUCTION" for only part of the FACILITIES shown, then the DRAWING shall be clearly marked to show which parts of the DRAWING are approved, and for what purpose it is "APPROVED FOR CONSTRUCTION".



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

4.4.2 Document Review by PTT

PTT intends to review comment/approve on documents within 5 working days from receipt by PTT. PTT will make efforts to return documents within a shorter period. Any documents for special review may take longer due to transmission delays, and comment consolidation, etc.

CONTRACTOR is encouraged to liaise with all parties to minimize the impact on CONTRACT schedule.

Compliance with PTT comments shall not relieve CONTRACTOR of responsibility for the correctness of his own, VENDORS' or SUBCONTRACTORS' work, or of any requirements, warranties or guarantees stated or implied in the CONTRACT documents.

Similarly, agreement or lack of comment by PTT on DRAWINGS and documents shall not constitute approval of any deviations from the PROJECT SPECIFICATION. CONTRACTOR shall advise PTT of any PTT comments that appear to conflict with the PROJECT SPECIFICATION for resolution.

PTT reserves the right to review, on request, any design DRAWING, specification, standard or other document produced by CONTRACTOR.

4.5 **Documents Required for Information, Project Completion and Record**

In addition to the documents and DRAWINGS required for engineering, procurement, construction and commissioning, CONTRACTOR shall supply the documents listed below for information, project completion and PROJECT RECORD.

4.5.1 Document Index

Shall be prepared and issued monthly and as a minimum shall include



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<p style="text-align: center;">Related standard systems</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

DRAWING/document number, revision, title, planned, forecast and actual issue dates and document transmittal number. The Document Index shall be sorted by document type as identified in ES-99.01: Numbering System. An exception report shall also be issued on a monthly basis identifying documents that have missed their planned issue date. Report shall include DRAWING/document number, revision, title, planned, forecast and actual issue dates.

Planned issue dates shall not be revised except with the agreement of PTT.

4.5.2 VENDOR Document Index

Shall be prepared and issued monthly, by CONTRACTOR, and as a minimum include the VENDOR Document Number, PTT Document Number, revision, VENDOR name, planned, forecast, review status and actual issue dates and document transmittal number.

An exception report shall also be issued on a monthly basis identifying overdue documents to/from the VENDOR. Report shall include VENDOR Document Number, PTT Document Number, revision, VENDOR name, planned, forecast, and actual issue dates.

Planned issue dates shall not be revised except with the agreement of PTT. SUBCONTRACTOR's documents shall also be included on this index.

4.5.3 Requisition Index

Shall be prepared and issued monthly, and as a minimum, shall include requisition number, title, revision status, planned, forecast and actual issue dates, etc.

An exception report shall also be issued on a monthly basis identifying unpurchased equipment item number, title, requisition number, requisition



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

planned and forecasted dates.

Planned issue dates shall not be revised except with the agreement of PTT.

4.5.4 Final Documentation

The Final Documentation shall be in the format that specified by PTT.

Book	Title
ID	Master Index
ED	Engineering Document Book
MM	Equipment and Maintenance Book
OM	Operation Manual
CD	Manufacturer Record Book
SM	Spare Part Manual
FI	Field Inspection Record
ED	Electronic Book
PD	Permitting Data Records

CONTRACTOR shall complete the Final Documentation in accordance with Engineering Standard ES-99.04: Final Documentation. The number of copies and issue date for Final Document is summarized below:-

CONTRACTOR shall supply 1 set of Engineering Document Book/ Equipment and Maintenance Book/ Operation Manual/ Manufacturer Record Book/Spare Part Manual/ Field Inspection Record and 1 set of both native electronics files and PDF which are handed over in external hard



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

disk format, within 1 month after COMMISSIONING.

INITIAL ACCEPTANCE cannot be achieved unless all elements comprising the Final Documentation are submitted to PTT.

4.5.5 As Built DRAWINGS

CONTRACTOR and his VENDORS and SUBCONTRACTORS shall supply DRAWINGS revised to show the "As Built" FACILITIES and stamped accordingly. All as built DRAWINGS provided finally to PTT prior to INITIAL ACCEPTANCE shall be properly drafted. Red line mark ups are not acceptable in the PROJECT RECORD but shall be provided prior to commencement of commissioning of the relevant subdivision of the UNIT.

4.5.6 Transfer of Data to PTT's SAP System

CONTRACTOR shall prepare the equipment list data and recommended spare parts data in a format that can be transferred to PTT's SAP system. This shall be ready for transfer prior to MECHANICAL COMPLETION. PTT will provide the Database structure for CONTRACTOR to populate. It is suggested this WORK is carried out by a specialist SUB CONTRACTOR subject to PTT approval.

4.6 **Control of VENDORS Drawings**

In the context of this paragraph SUBCONTRACTORS' DRAWINGS and documents shall be treated as for VENDORS' DRAWINGS.

4.6.1 Checking and Approving VENDORS' DRAWINGS

CONTRACTOR is responsible for checking and approving all VENDOR's DRAWINGS, data sheets and other documentation to ensure that the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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VENDOR is complying with the PROJECT SPECIFICATION.

CONTRACTOR shall ensure that all VENDORS' DRAWINGS are numbered in accordance with the PROJECT SPECIFICATION and that all DRAWINGS clearly indicate order number and item number for later easy identification.

4.6.2 Final VENDORS' DRAWINGS

Once all CONTRACTOR's and PTT's comments have been incorporated and both the VENDOR and CONTRACTOR are satisfied that the documentation clearly and accurately shows the equipment as supplied, the DRAWINGS shall be issued and distributed as 'Final'. Only final DRAWINGS and document being good quality (i.e. legible and appropriate size) and printed from VENDOR's native electronic file shall be incorporated in the PROJECT RECORD as defined in ES-99.04: Final Documentation. The scanned DRAWINGS & documents are not allowed to be included in PROJECT RECORD.

Certain VENDOR's DRAWINGS shall require revision to 'As Built' status to reflect changes made during installation and commissioning.

CONTRACTOR shall include in the 'As Built' DRAWING procedure his procedure for revising VENDOR DRAWINGS.

4.7 **Engineering Work by VENDORS or Subcontractors**

CONTRACTOR is responsible for any engineering work carried out by VENDORS or SUBCONTRACTORS. Engineering and design shall only be subcontracted in accordance with CONTRACTOR's PROJECT EXECUTION PROPOSAL as agreed with PTT and incorporated into the CONTRACT. Any further sub contracting of either engineering or



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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draughting work shall require prior approval of PTT.

5 GENERAL ENGINEERING AND DESIGN REQUIREMENTS

CONTRACTOR should note that at the completion of the FEED there were certain areas of the plant which were still under development and the resulting changes may not have been fully incorporated into all design documents. The status of these changes and the required further WORK are detailed in SCOPE OF WORK. CONTRACTOR shall fully incorporate these developments into the design and include for the effects of these in preparing his bid.

5.1 **Project Engineering**

The numbering system to be used on documents, DRAWINGS, and equipment items is defined in ES-99.01: Numbering System. CONTRACTOR is responsible for ensuring consistency and avoiding duplication in application of the numbering systems across the CONTRACT.

5.1.1 Basic Engineering Design Data

Basic Engineering Design Data is provided in ES-99.00.05: Basic Engineering Design data, this provides climatic data, utilities, design specifications and criteria for all equipment items, civil engineering, piping, instrumentation and control systems, electrical requirements, protective cover, safety FACILITIES and transportation FACILITIES. CONTRACTOR shall revise and re-issue the Basic Engineering Design Data to reflect development during detailed engineering. All changes to the Basic Engineering and Design Data must be approved by PTT.

All materials shall be suitable for long term installation in the tropical industrial environment existing at SITE. CONTRACTOR shall ensure that materials and surface coatings are adequate for the environment in which



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

they are installed. In all cases, materials and surface coatings shall be in accordance with the Project Standards. Special consideration shall be given to materials used in highly corrosive conditions.

CONTRACTOR shall ensure that no use is made of asbestos in any form. Similarly due note of environmental effects shall be taken when specifying any materials, including such aspects as the Montreal Protocol.

5.1.2 Engineering Standards

CONTRACTOR shall produce a list of International and Local Codes in accordance with PTT's Engineering Standards and identify the number, edition and issue date. The list shall be sorted by organization and standard number and submitted to PTT for review and approval. The revision in force at AWARD OF CONTRACT shall apply.

Where an Engineering Standard is not provided in PTT's Engineering Standards, CONTRACTOR shall develop a suitable standard in PTT format. Approval is required from PTT before use.

CONTRACTOR shall prepare and issue a CAD Drafting Standard which identifies for each discipline the methodology used in the production of DRAWINGS. This shall include such things as layering, text format, attributes, cell library, line weights, line types etc. used in DRAWING production.

5.1.3 Piping and Instrument Diagrams

5.1.3.1 General

The P&IDs have been developed up to the stage given in the PROJECT SPECIFICATION. A HAZOP/SIL shall be carried out by CONTRACTOR (if required).



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

CONTRACTOR may refer to the HAZOP and SIL from the FEED package in attachment 4, but if the CONTRACTOR's detail designs differ or make the P&ID from the FEED package changes or new, CONTRACTOR shall create a new HAZOP and SIL for the affected or modified P&ID. The actions resulting from the HAZOP/SIL shall be incorporated at this stage. CONTRACTOR shall incorporate the HAZOP/SIL comments and be responsible for the satisfactory closeout of all HAZOP/SIL actions at CONTRACTOR's expense. CONTRACTOR shall further develop P&IDs in accordance with ES-99.02: Preparation of Piping and Instrument Diagrams, and the PROJECT SPECIFICATION. This includes LICENSOR P&ID's which may have been drawn using different Symbol. In addition CONTRACTOR shall incorporate HAZOP/SIL actions, Equipment and Instrumentation VENDOR information, all PTT and VENDOR formal review comments, all PTT comments during EPC phase and the result of engineering development. CONTRACTOR shall perform a consistency check on P&IDs to ensure that the P&IDs meet PROJECT SPECIFICATION. The following items shall be checked as a minimum:

- Line continuation /Termination



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

- Process/Utility line weight
- Insulation thickness
- Symbolic consistency
- Symbolic size
- Spec break

Where necessary CONTRACTOR shall break down P&IDs if during development, equipment and associated FACILITIES cannot fit within one P&IDs. All associated rework e.g. retag instrument, reallocate continuation DRAWINGS, etc. shall be performed by CONTRACTOR. The P&IDs of the EXISTING FACILITIES that are affected by the CONTRACT shall be revised by CONTRACTOR into the as built DRAWINGS issues. P&IDs produced by VENDORS or SUBCONTRACTORS shall be prepared in accordance with Engineering Standard ES-99.02 - Preparation of P&IDs and the PROJECT SPECIFICATION, and shall be treated as same as P&IDs developed by CONTRACTOR (i.e. distribution, Line Lists, etc.).

Where VENDOR or SUBCONTRACTOR P&IDs' fail to comply with Engineering Standard ES-99.02 - Preparation of Piping and Instrument Diagrams, CONTRACTOR shall redraught these at PTT's request. If this is necessary the "new" P&ID shall be fully integrated into CONTRACTOR's set of P&IDs in accordance with the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

standard.

The revision of P&IDs developed by CONTRACTOR shall start from Rev 01 onward. (Refer to Engineering Standard ES-99.01 Numbering System). All changes related with the latest revision of each P&ID shall be clearly marked.

CONTRACTOR shall propose, develop and implement an engineering data control system for use during the development of P&IDs to control information flow through CONTRACTOR's discipline, PTT.

5.1.3.2 Utility P&IDs

The Utility P&IDs developed as part of the basic process design package are at an elementary stage and reveals the minimum requirement of PTT. During detailed engineering the design for these systems shall be carried out and the Utility P&IDs shall be developed accordingly for all UNIT. CONTRACTOR shall not reduce the size/capacity/duty of any equipment items without prior written approval from PTT.

Every revision of these P&IDs shall be submitted to PTT for review and approval. As for process P&IDs any proposed additions/modifications that may jeopardize or compromise the currently built-in operating reliability and/or flexibility shall be rejected.

CONTRACTOR shall develop utility distribution P&IDs



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

in such a manner that users are shown in their correct geographic sequence.

5.1.3.3 Symbolic Sheet

The symbol used in the P&IDs shall be as included in ES-99.02: Preparation of P&IDs. CONTRACTOR shall further develop the symbol/graphics, as required during execution of the CONTRACT.

CONTRACTOR shall develop the standard detail P&IDs such as but not limited to motor standard details, instrument standard detail, sampling standard detail, pump harness, analyzer house hook-up, dry gas seal, machine condition monitoring, etc. in accordance with PROJECT SPECIFICATION.

In addition, CONTRACTOR shall develop an Engineering Standard for P&ID Drafting and customization for PTT review/approval.

5.1.3.4 Demolition P&IDs

CONTRACTOR shall prepare demolition P&IDs (based on the existing P&IDs) showing where EXISTING FACILITIES are being removed or relocated.

5.1.3.5 Reference P&IDs

A set of PTT's P&IDs of EXISTING FACILITIES are provided TOR where interfacing with these EXISTING FACILITIES is required. CONTRACTOR shall update



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

these P&IDs to 'As Built' status where there are interfaces with the existing plant.

5.1.4 Line List

The Line Lists shall be considered as an integral part of the P&ID and shall be reissued at the same time as the associated P&IDs. CONTRACTOR shall develop a line list database that is able to generate the report in accordance with Engineering Standard ES-99.02 - Preparation of P&IDs. CONTRACTOR shall note the requirements for cross referencing piping line numbers allocated to VENDORS and SUBCONTRACTORS within CONTRACTOR's P&IDs (refer to Engineering Standard ES-99.02 Preparation of P&IDs).

The line list report shall identify the following information as minimum:-

- Line number
- Line origin
- Line destination
- Medium
- P&ID number
- Design Pressure/Design Temperature
- Operating Pressure/Operating Temperature
- Test Medium
- Pressure Test
- Paint Code
- Criticality code
- Report revision
- NDE requirements



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

- PWHT requirements
- Tracing requirements
- Insulation type and thickness.

5.1.5 Equipment List

CONTRACTOR shall develop an equipment list database with content and information in accordance with ES-99.02: Preparation of P&IDs. The Equipment List report shall be able to generate from the database.

The Equipment List shall be developed with the details as shown in the PTT's preliminary Equipment List, in order to be able to be imported to PTT's SAP system.

If required, Equipment List shall be prepared in the format as may be required by local law, statutory or government regulations.

5.1.6 Tie-ins/Battery Limit List

Mechanical tie-in list refers to Attachment 4 Piping Tie-in List

CONTRACTOR shall develop Tie-in Lists and Battery Limit Lists

summarizing size, location, rating, design and operating conditions, type of tie-in and any other appropriate information required in accordance with the PROJECT SPECIFICATION.

For piping tie-in hot tap work, PTT have the right to qualify hot tap vendor by basing on references, experience and quality.

CONTRACTOR shall submit hot tap procedure to PTT for approval in advance including scope of 100% mock up of all tie-in points before execution at site.

The EXISTING FACILITIES also include FACILITIES owned, operated or controlled by others. CONTRACTOR shall liaise with PTT, OTHER



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

PTTs and other affected organizations for developing Tie-in method statements and tie-in plans. Tie-in methods and tie-in planning shall be approved by PTT.

5.1.7 Fire Protection DRAWINGS

CONTRACTOR shall develop fire protection DRAWINGS in accordance with PROJECT SPECIFICATION. The fire protection DRAWING shall be based on the Plot Plan and shall show the following as a minimum: CO₂, fire extinguishers, hydrants, monitors manual call points, etc. and shall meet NFPA latest codes any local authority requirements and Thai Laws.

5.1.8 Special Parts List

Special Parts are items that are not defined as commodity bulk material or Equipment items such as sampling point connections, valve interlocks, fabricated drain pots etc. CONTRACTOR shall develop Special Part List, Special Part Data Sheet (including detail DRAWINGS where required) and requisition. A cross reference shall also be made on the Isometric Bill of Material.

5.1.9 Site material identification and control

CONTRACTOR shall develop a site material identification and control procedure for PTT review and approval. This shall cover all materials but especially alloy steels, non-ferrous alloys and special carbon steels. Alloy steels are all grades of CrMo steels, Nickel alloys and stainless steels. Special carbon steels are defined as those supplied to material specifications requiring impact testing. The procedure shall address the following subjects:-

- Material certification, marking and color coding.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

- Stage, final and site receipt inspection.
- Material control in SITE stores/laydown area.
- Issue of bulk materials from stores/laydown area.
- Fabrication of piping spools.
- Piping erection.
- Positive Material Identification.
- Final documentation.

5.2 Process Engineering

5.2.1 Introduction

This section highlights process design WORK in certain areas which require further work/development or verification as part of the CONTRACTOR's detailed SCOPE

OF WORK. Process Description and Process Design Basis shall be referred to Process Description in attachment 4, The documents are provided for the Bidders' information only.

CONTRACTOR shall, during the execution of the CONTRACT, verify the process engineering work as detail in FEED Package (Attachment 4).

CONTRACTOR shall guarantee all process detailed designs.

In the event that during detailed engineering CONTRACTOR feels that he can provide significant improvements in the design of the UNIT,

CONTRACTOR shall provide details of his proposals to PTT for review and approval. PTT retains the right to accept or reject these proposals.

During detailed engineering CONTRACTOR shall not reduce the sizes of any equipment items or lines nor shall he delete instrumentation and valves



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

from the process design documents without written approval from PTT.

Any modifications/revisions to the P&IDs that affect to process, CONTRACTOR shall perform HAZOP and SIL for the modification node in P&IDs. In case that modification affect to equipment data sheets, plot plan or any DRAWINGS/documents, CONTRACTOR shall submit to PTT for reviewing.

CONTRACTOR shall be solely responsible for any increase in the size of equipment items, lines, instrumentation, and valves and any necessary process modifications during the detailed engineering phase. Any extra cost shall be to CONTRACTOR's account.

Detailed engineering work in all process and utility areas shall be carried out in accordance with PTT's specifications and requirements and the DRAWINGS and data developed by PTT during the front end engineering design (FEED) and which forms part of the PROJECT SPECIFICATION.

5.2.2 PFD and Heat/Material Balance

The FEED package comprising PFD's and Heat/ material balance represents the processing scheme that OWNER/CONSULTANT wants to incorporate in UNIT. In addition, details of the design basis are referred to Process Description and Process Design Basis. CONTRACTOR shall verify the design in its entirety in all areas of the UNIT and confirm acceptance of all Process Flow Diagrams (PFD's) and heat/ material balances. CONTRACTOR shall provide all process guarantees for the process design as attachment 12.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

CONTRACTOR shall develop PFDs and Heat/ material balance in according to OWNER's/CONSULTANT's requirements in PROJECT STANDARDS.

CONTRACTOR shall re-draught and develop PFDs in accordance with the PROJECT SPECIFICATION. The revision of PFD's developed by CONTRACTOR shall start from Rev 'O1' onward. (Refer to Project Numbering System, included in the PROJECT SPECIFICATION). In addition, CONTRACTOR shall incorporate Equipment and Instrumentation VENDOR information, all OWNER/CONSULTANT and VENDOR formal review comments, all OWNER/CONSULTANT's comments during EPC phase and the result of engineering development.

PFDs produced by VENDORS or SUB CONTRACTORS shall be prepared in accordance with the PROJECT STANDARDS and shall be treated as for PFDs developed by CONTRACTOR (i.e. distribution, Line Lists, etc.).

Where VENDOR or SUBCONTRACTOR's PFDs fail to comply with PROJECT STANDARDS, CONTRACTOR shall redraft these at OWNER'S/CONSULTANT's request. If this is necessary, the "new" PFD shall be fully integrated into CONTRACTORS set of PFDs in accordance with the standard.

The basic process design includes major areas required further work.
CONTRACTOR work however shall not be limited to these areas only.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

Detailed process engineering work shall be carried out in all areas of the UNIT and CONTRACTOR shall be responsible for the entire design and shall provide all process guarantees. In addition, CONTRACTOR shall ensure that the final design satisfies all aspects of the Process Description and Process Design Basis provided in PROJECT SPECIFICATION.

5.2.3 Equipment Data Sheets

A set of process data sheets for equipment items has been prepared and provided in the PROJECT SPECIFICATION. CONTRACTOR shall verify the size/capacity/duty as applicable for each data sheet and ensure that it shall perform as desired. All Equipment shall be sized to operate satisfactorily under all operating scenarios, including any special requirements. CONTRACTOR shall reissue all equipment data sheets to OWNER/CONSULTANT for review and approval.

During detailed engineering CONTRACTOR shall not reduce the size/capacity/duty of any equipment items without prior written approval from OWNER/CONSULTANT. In the event that the size/capacity/duty of any equipment items needs to be increased as a result of an oversight by CONTRACTOR to verify the same during bid stage, the cost of such increase shall be to CONTRACTOR's account.

During detailed engineering, CONTRACTOR shall develop all relevant equipment data sheets required to complete the WORK in accordance with the PROJECT SPECIFICATION incorporating all engineering and



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

VENDOR data. The data sheets shall be issued to OWNER/CONSULTANT for review and acceptance. The data sheet format shall be the same as provided in the PROJECT SPECIFICATION.

The design basis, computer runs, and calculations shall be provided for exchangers, drums, pumps, air coolers, tanks, line sizes, relief valve sizes, control valve sizes and all process equipment items. These shall also include all hydraulic calculations for vacuum evaporator and pump NPSH.

5.2.4 Instrumentation

Instrumentation shown around vendor equipment is the minimum for process requirements. Full details of instrumentation requirements are to be developed by CONTRACTOR in conjunction with the selected equipment vendor and the applicable PROJECT SPECIFICATION.

Control Valves

The basic process engineering design includes control valve sizing data. CONTRACTOR shall carry out all hydraulic calculations and adjust flow rates and pressure drops as necessary.

Control valve data sheets shall provide complete process data for minimum, normal and maximum expected flow rates, along with pressure drops to be considered for each case across the valve. The physical properties of the fluid shall be stated. The data sheet shall also specify the amount of flashing, if any, expected across the valve.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

Valve actuators for Control Valves shall be operated by pneumatic actuators only.

All control valves shall be sized to operate satisfactorily under all operating scenarios, including any special requirements

CONTRACTOR shall issue all control valve data sheets to OWNER/CONSULTANT for review and comment.

Emergency Isolation Valve (XV)

The requirement of Emergency Isolation Valve (XV) contained within PROJECT SPECIFICATIONS CONTRACTOR shall develop XV requirements in accordance with PROJECT SPECIFICATION.

Valve actuators for Emergency Isolation Valves (XV) shall be operated by pneumatic actuators only.

CONTRACTOR shall issue all XV data sheets to OWNER/CONSULTANT for review and comment.

Instrument Data Sheets

CONTRACTOR shall provide instrument data sheet and ensure that all instruments shall perform as desired.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Instrument data sheets shall include complete process data for the entire operating range of the instrument, which shall include maximum, normal and minimum operating conditions. The process data sheet shall also take cognizance of start-up, shutdown and transient conditions to ensure that the instrument performs its function over the full range of process conditions. Design pressure and temperature shall also be included on the instrument data sheets.

During detailed engineering, CONTRACTOR shall prepare/develop all instrument data sheets incorporating all engineering and VENDOR data. The data sheets shall be issued to OWNER/CONSULTANT for review and acceptance. The data sheet format shall be in accordance with PTT Engineering Standard as provided in the PROJECT SPECIFICATION

The design basis, computer runs, and calculations shall be provided for relief valve sizes, orifice sizing, thermowell wake frequency and control valve sizes.

Relief Valves

CONTRACTOR shall provide relief valve data sheet with all relief cases during detailed engineering. In addition, CONTRACTOR shall calculate all relief valve inlet and outlet line sizes based upon final isometric drawings and in accordance with PROJECT SPECIFICATION.

During detailed engineering CONTRACTOR shall size all relief valves, as



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

a guideline, in accordance with the PROJECT SPECIFICATION.

CONTRACTOR shall prepare/develop the Relief valve process data, including relief valve sizes and inlet and outlet line sizes and ensure that all instruments shall perform as desired.

CONTRACTOR shall verify all relief cases and size all relief valves during detailed engineering. In addition, CONTRACTOR shall calculate all relief valves inlet and outlet line sizes based upon final isometric drawings.

CONTRACTOR shall ensure that, during all stages of the development and detailed engineering of relief valve systems, all aspects of the PROJECT SPECIFICATION are fully met.

5.2.5 Relief and Emergency De-pressuring Systems

The Relief and Emergency De-pressuring Systems have been developed to a point wherein the basic process concepts and the instrumentation required to protect the UNIT have been defined.

CONTRACTOR shall verify the design of the Relief and Emergency De-pressuring Systems and further develop the design during detailed engineering. OWNER/CONSULTANT will review any/all changes made by CONTRACTOR to the Relief and Emergency De-pressuring Systems. Any proposed additions/modifications to the Relief and Emergency De-pressuring Systems by the CONTRACTOR that may jeopardize or compromise the currently built-in safety, reliability and/or flexibility shall



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

be rejected. CONTRACTOR shall then rectify/modify the design, without cost impact to OWNER/CONSULTANT, to OWNER/CONSULTANT satisfaction.

During all stages of the development and detailed engineering of the Relief and Emergency De-pressuring Systems, CONTRACTOR shall ensure that the design philosophies detailed in PROJECT SPECIFICATION are fully complied with and followed.

5.2.6 Blowdown and Drainage Systems

CONTRACTOR shall fully detail and design Blowdown and Drainage Systems including all of the feeds into the Blowdown Header, the interconnections between the Flare Header and Blowdown drum, etc. During detailed engineering, the P&ID's shall be developed for the entire UNIT. During all stages of the development and detailed engineering of these systems, CONTRACTOR shall ensure that the requirements in PROJECT SPECIFICATION are complied with, in principle.

The blowdown and drainage systems have been developed to a preliminary level as part of the FEED Package. During detailed engineering CONTRACTOR shall fully detail/design these systems and the P&ID's shall be developed accordingly for the entire UNIT. During all stages of the development and detailed engineering of the blowdown and drainage systems, CONTRACTOR shall ensure that the PROJECT



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

SPECIFICATION is complied with, in principle.

5.2.7 Interlock Logic Diagrams and Sequences Flow Charts

The Interlock Logic Diagrams and Sequences Flow Charts have been developed to a preliminary level as part of the FEED Package. During detailed engineering CONTRACTOR shall fully develop the Interlock Logic Diagrams and Sequences Flow Charts in accordance with PROJECT SPECIFICATION. CONTRACTOR shall incorporate HAZID and HAZOPs actions, Equipment and Instrumentation VENDOR information, all OWNER/CONSULTANT, VENDOR and all OWNER/CONSULTANT comments during EPCC phase and the result of engineering development.

5.2.8 Cause and Effects Charts

CONTRACTOR shall fully detail and design Cause and Effect Charts for the DCS Interlocking and ESD system based on preliminary Interlock Logic Diagrams, Sequences Flow Charts, and P&ID's on the FEED Package and P&ID's. These charts list all major events, which require automatic response in the form of shutdown or start-up of equipment items and/or open/close valves. The charts shall provide a philosophy for how the UNIT shall be operated, and how it shall function in terms of automation and operator interface.

The Cause and Effect Charts identify the first line of upset and response.

Further consequences/impacts on other operating equipment are not



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

defined, CONTRACTOR shall develop the Cause and Effect Charts during the detailed engineering phase including any actions from the preliminary HAZOP/SIL review. The Cause and Effect Charts shall list all alarms/trip set point, valve status, equipment status, and whether operating or shutdown, that can be subjected to shut-down or start-up as a result of variations/upsets in the process operating parameters anywhere in the UNIT. The cause and effect charts shall also indicate the target SIL level of each safety function.

CONTRACTOR shall incorporate HAZID and HAZOPs actions, Equipment and Instrumentation VENDOR information, all OWNER/CONSULTANT, VENDOR's formal review comments, all OWNER/CONSULTANT comments during EPC phase and the result of engineering development.

5.2.9 Utility, Effluent and Drainage, and Chemicals Summaries

CONTRACTOR shall fully detail design and develop the following summaries:

- o Utility
- o Effluent and Drainage
- o Chemicals

The summary shall be based upon preliminary information within PROJECT SPECIFICATION and shall be verified and where necessary updated by CONTRACTOR to reflect the final design of the UNIT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

CONTRACTOR shall update the utility balances, effluent & drainage and chemical given in the design in the light of specific information received from vendors and to ensure that the design of the utilities systems reflects the updated quantities.

5.2.10 Hydraulic Design

The P&ID's contain preliminary line sizes for the main process piping systems. CONTRACTOR shall perform detailed hydraulic sizing for all lines to verify all piping sizes to ensure that the final plot plan, equipment elevations, equipment design pressures, and pump and compressor heads are taken into account in accordance with PROJECT SPECIFICATION. Surge analysis is to be carried out by CONTRACTOR, where required.

In addition, all pressure relief valve inlet and outlet lines shall be sized by CONTRACTOR using final isometric layouts in accordance with PROJECT SPECIFICATIONS as a guideline. All pressure relief valve inlet and outlet lines shall be sized by CONTRACTOR using final isometric layouts.

5.2.11 Process Control

CONTRACTOR shall fully detail design and develop the process control schemes, which necessary to perform over all expected operating conditions of the UNIT. The process control schemes detailed within the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

FEED package are at an elementary stage. CONTRACTOR shall verify that these process control schemes will perform as required over all expected operating conditions. Where CONTRACTOR feels additional process control is necessary, CONTRACTOR shall develop the process control scheme as required. Any additional costs as a result of the development of the process control schemes shall be borne by CONTRACTOR.

CONTRACTOR shall produce Process Control Narratives describing, in detail, all process control schemes, these shall be submitted to OWNER/CONSULTANT for review and approval.

5.2.12 Design Calculations

CONTRACTOR shall provide, to OWNER/CONSULTANT any/all calculations for the process engineering work. OWNER/CONSULTANT reserves the right to request calculations and/or request technical explanations and/or review some or all of the work being carried out at any time. CONTRACTOR shall respond to all requests in a prudent, professional and timely manner.

Following is a list of areas for which detailed calculations shall be submitted as a minimum:

Process Simulations

For process simulation work CONTRACTOR shall use ASPEN HYSYS or ASPEN Plus.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

A complete set of the simulation model shall be provided to OWNER/CONSULTANT for each case.

Equipment Design

Calculations and computer program printouts for the sizing of heat exchangers, safety valves, control valves, and air coolers shall be provided. Design basis, calculations, including VENDOR data, where relevant, shall be supplied for exchangers, vessels and pumps.

Process Instrument Datasheets

CONTRACTOR shall provide process calculations for the sizing of all orifice plates, control valves and pressure relieving devices including detailed hydraulic calculations for inlet and outlet line sizes. If computer programs are used, a complete set of printouts for the calculations shall be provided.

If required, during detailed design, CONTRACTOR shall carry out a surge analysis using FLOWMASTER software and shall provide a report to OWNER/CONSULTANT which demonstrates that the maximum surge pressure that can be generated is not greater than the design pressure of the system.

5.2.13 Operating Manual

While some operating guidelines have been presented in the SPECIFICATION, CONTRACTOR shall develop, Operating Manual,



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

detailed start-up, shut down and purge procedures etc. for all systems and units based on Operating Guideline in FEED Package, and PROJECT SPECIFICATION. CONTRACTOR is also required to modify the P&ID's to include any special start-up, shut down, venting, purging lines and any special instrumentation required for these transient operations.

5.2.14

5.2.15 UNIT Specific Requirements

Refer to the Process Description and Process Design Basis, there are main specific equipment that CONTRACTOR shall emphasize the following

- Advanced Oxidation Package at CWWTP
- Gas Compressor for Regeneration and Refrigeration

Advanced Oxidation Package

CONTRACTOR shall supply and install the Advanced Oxidation Package that

including but not limit to the following equipment

- Reactor/Drum
- Ozone Generator
- Oxygen generator
- Instrument equipment e.g. Field instrument, Unit Control Panel, Local Control Panel
- etc.

- Electrical equipment e.g. LV motor, MV motor, Liquid Rheostat and Secondary Control Panel etc.

Gas Compressor Unit



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network		
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL	Create date : 07 April 2023 Rev.1 SAP PR No.1120018712	Division/Department : Technical and Asset Engineering Division
Related standard systems		
<input checked="" type="checkbox"/> Quality	<input type="checkbox"/> Safety	<input type="checkbox"/> Health
	<input type="checkbox"/> Environment	<input type="checkbox"/> Lab
		<input checked="" type="checkbox"/> Energy

CONTRACTOR shall install the Gas Compressor unit which is driven by MV motor

including but not limit to the following equipment

- Lube oil system
- Dry gas seal system
- Oil Cooler
- Instrument equipment e.g. Field instrument, Unit Control Panel, Local Control Panel
- etc.
- Electrical equipment e.g. LV motor, MV motor, Liquid Rheostat and Secondary Control Panel etc.

CONTRACTOR shall revise P&ID of compressor packages according to PTT format.

5.2.16 PTT document

The PTT' document to execute the project for Philosophy, Design Guideline are following

PTT Doc / DWG No.	Description
PH-10-01	PROJECT PHILOSOPHY FOR ISOLATION PHILOSOPHY



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

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MR. SAHAPONG NOPCHAROEN

MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

PTT Doc / DWG No.	Description
PH-10-02	PROJECT PHILOSOPHY FOR OVERPRESSURE PROTECTION PHILOSOPHY
PH-10-03	PROJECT PHILOSOPHY FOR EMERGENCY SHUTDOWN PHILOSOPHY
PH-10-04	PROJECT PHILOSOPHY FOR DRAINAGE PHILOSOPHY
PH-10-05	PROJECT PHILOSOPHY FOR FLARING AND VENTING PHILOSOPHY
PH-10-06	PROJECT PHILOSOPHY FOR EMERGENCY DEPRESSURING PHILOSOPHY
PH-10-08	PROJECT PHILOSOPHY FOR PROCESS CONTROL AND OPERATION PHILOSOPHY
PH-10-31	PROJECT PHILOSOPHY FOR PRECOMMISSIONING, COMMISSIONING AND ACCEPTANCE PHILOSOPHY
PH-10-32	PROJECT PHILOSOPHY FOR SYSTEM PHILOSOPHY AND COMPLETION
PH-60-01	INSTRUMENT AND CONTROL PHILOSOPHY



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network		
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL	Create date : 07 April 2023 Rev.1 SAP PR No.1120018712	Division/Department : Technical and Asset Engineering Division
Related standard systems		
<input checked="" type="checkbox"/> Quality	<input type="checkbox"/> Safety	<input type="checkbox"/> Health
	<input type="checkbox"/> Environment	<input type="checkbox"/> Lab
		<input checked="" type="checkbox"/> Energy

PTT Doc / DWG No.	Description
PH-70-01	ELECTRICAL DESIGN BASIS AND DESIGN PHILOSOPHY
PH-90-01	WORKSITE HSS REQUIREMENT
PH-90-02	HSE PREQUALIFICATION EXPECTATION
PH-91-01	WORKSITE ENVIRONMENT REQUIREMENT
PR-10-03	DESIGN GUIDELINES
PR-10-32	GUIDELINE OPERATION AND MAINTENANCE PREPARATION
PR-90-01	SAFETY & HEALTH MANAGEMENT PLAN
PR-91-01	ENVIRONMENT MANAGEMENT PLAN

5.2.17 Tie-in Task during Turnaround Period

Due to the scope of the project relating to the modification of the existing plant, CONTRACTOR shall conduct a tie-in process piping including with all related Instrument and Electrical systems with the existing plant during the turnaround period for New Regeneration Gas Compressor systems of GSP2, GSP3 and New Refrigeration system for Remaining Gas treatment (RGT).



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

5.3 Mechanical Engineering

CONTRACTOR shall be responsible for delivering a complete design and ready-to-operate for Process Equipment for the UNIT in accordance with the PROJECT SPECIFICATION.

The scope of mechanical work shall be at least but not limited to as following.

5.3.1 Isolate Existing Equipment

5.3.1.1 CONTRACTOR shall isolate and demolish existing equipment. There are regeneration gas compressors GSP2 and GSP3 and related equipment and accessories, in accordance with the technical information provided in Attachment 04.

5.3.2 Regeneration Gas Compressor GSP2, GSP3 and Refrigeration Gas Compressor

- 5.3.2.1 CONTRACTOR shall install the COMPRESSOR including but not limit to the following equipment;
- Lube oil skid including Coolers and all accessories: Water-Cooled Shell & Tube Heat Exchanger for Regeneration Gas Compressor GSP2, GSP3 / Air-Cooled Heat Exchanger for Refrigeration Gas Compressor
 - Dry gas seal skid including all accessories
- 5.3.2.2 CONTRACTOR shall supply and install piping from COMPRESSOR to PTT utility such as cooling water, instrument air, nitrogen, sealing gas and other related utility that used for COMPRESSOR.
- 5.3.2.3 CONTRACTOR shall supply and install manual valves (isolation valves) for cooling water supply and return lines



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

of lube oil coolers.

- 5.3.2.4 CONTRACTOR shall install cold insulation on the casing of Refrigeration Gas Compressor and its related accessories.

5.3.3 Regeneration Gas Coolers (E-78106, 3302-E-05), Refrigeration Condenser (5590-E-005)

- 5.3.3.1 Thermal and mechanical design of the air-cooled heat exchanger
- 5.3.3.2 Supply all materials and consumable required for fabrication air-cooled heat exchanger
- 5.3.3.3 Complete shop fabrication of air cooled heat exchanger bundles assembly with frame and tube support
- 5.3.3.4 Inspection, non-destructive testing and hydrostatic testing
- 5.3.3.5 Surface preparation and painting
- 5.3.3.6 Preservation and preparation for shipment
- 5.3.3.7 Documentation as required in requisition
- 5.3.3.8 Guarantees for thermal performance, mechanical design, materials, workmanship, etc.
- 5.3.3.9 Supply completed set of air-cooled exchangers to meet the design condition as specified on datasheet
- 5.3.3.10 Supply air cooled bundles with frame, fans and support structure
- 5.3.3.11 Supply air plenum
- 5.3.3.12 Supply manual fan blade pitch adjustment
- 5.3.3.13 Supply vibration transmitter



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

- 5.3.3.14 Supply fan protection screen
- 5.3.3.15 Supply personal protection screen at header
- 5.3.3.16 Supply electric motors and transmission systems
- 5.3.3.17 Supply ladders, platforms and walkways for headers service
- 5.3.3.18 Supply nozzles as per datasheet (nozzle with blind flange shall be provided with bolting and gasket). Mating flanges (c/w bolting and gaskets for non-standard flange connection
- 5.3.3.19 Supply lifting lugs
- 5.3.3.20 Supply earthing lugs/ bosses
- 5.3.3.21 Supply setting bolts, nuts and washers
- 5.3.3.22 Supply nameplate with brackets
- 5.3.3.23 Supply spares for start-up, erection and commissioning
- 5.3.3.24 Supply any additional items required and specified on the mechanical datasheet
- 5.3.3.25 Supply special tools (if required)

5.3.4 Refrigeration Suction Drum (5590-D-003), Refrigeration Accumulator (5590-D-004)

- 5.3.4.1 Mechanical design of the pressure vessel
- 5.3.4.2 Supply all materials and consumable required for fabrication
- 5.3.4.3 Complete shop fabrication
- 5.3.4.4 Inspection, non-destructive testing and hydrostatic testing
- 5.3.4.5 Surface preparation and painting



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

- 5.3.4.6 Preservation and preparation for shipment
- 5.3.4.7 Drawings and documentations as required and requisition
- 5.3.4.8 Guarantees for mechanical design, materials, workmanship, etc.
- 5.3.4.9 Equipment transport to site
- 5.3.4.10 Supply vessels to meet the design condition as specified on datasheet
- 5.3.4.11 Supply skirt support, anchor chair and anchor bolt template
- 5.3.4.12 Supply nozzles as per datasheet (nozzle with blind flange shall be provided with bolting and gasket). Mating flanges (c/w bolting and gaskets for non-standard flange connection
- 5.3.4.13 Supply manways c/w blind flanges, bolting, gaskets, davits and ladder rung
- 5.3.4.14 Supply clips support for piping, insulation and fireproofing
- 5.3.4.15 Supply platforms and ladders
- 5.3.4.16 Supply both of internal removable and fixed parts as specified in datasheet
- 5.3.4.17 Supply lifting lugs and tailing lug
- 5.3.4.18 Supply earthing lugs
- 5.3.4.19 Supply anchor bolts, nuts and washers
- 5.3.4.20 Supply nameplate with bracket
- 5.3.4.21 Supply spares for start-up, erection and commissioning



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

- 5.3.4.22 Supply pickling, cleaning and passivation
- 5.3.4.23 Supply list of recommended spares for two (2) years operation
- 5.3.4.24 Supply any additional items required and specified on the mechanical datasheet
- 5.3.4.25 Supply special tools (if required)

5.3.5 Desuperheater (5590-Y-002)

- 5.3.5.1 Mechanical design for all applicable leadings
- 5.3.5.2 Supply all materials and consumable required for fabrication
- 5.3.5.3 Complete shop fabrication
- 5.3.5.4 Inspection, non-destructive testing and hydrostatic testing
- 5.3.5.5 Surface preparation and painting
- 5.3.5.6 Preservation and preparation for shipment
- 5.3.5.7 Drawings and documentations as required and requisition
- 5.3.5.8 Guarantees for mechanical design, materials, workmanship, etc.
- 5.3.5.9 Equipment transport to site
- 5.3.5.10 Supply spares for start-up, erection and commissioning
- 5.3.5.11 Supply pickling, cleaning and passivation
- 5.3.5.12 Supply list of recommended spares for two (2) years operation
- 5.3.5.13 Supply any additional items required and specified on the mechanical datasheet
- 5.3.5.14 Supply special tools (if required)



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

5.3.6 Activated Carbon Filter (S-300-01), Carbon Fine Filter (S-300-02)

5.3.6.1 Mechanical design for all applicable loadings and confirm thickness, weight, base shears, and base 3 moments.

5.3.6.2 The vessel shall be provided with filter bed for activated carbon. The activated carbon shall be non-regenerative type

5.3.6.3 Design and provide the filter dimension (diameter, thickness and length) in accordance with process requirement

5.3.6.4 Supply all materials and consumable required for fabrication

5.3.6.5 Complete shop fabrication

5.3.6.6 Inspection, non-destructive testing and hydrostatic testing

5.3.6.7 Surface preparation and painting

5.3.6.8 Preservation and preparation for shipment

5.3.6.9 Drawings and documentations as required and requisition

5.3.6.10 Guarantees for mechanical design, materials, workmanship, etc.

5.3.6.11 Equipment transport to site

5.3.6.12 Supply vessels to meet the design condition as specified on datasheet

5.3.6.13 Supply nozzles as per datasheet (nozzle with blind flange shall be provided with bolting and gasket). Mating flanges (c/w bolting and gaskets for non-standard flange connection



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

5.3.6.14 Supply platforms and ladders

5.3.6.15 Supply lifting lugs and tailing lug

5.3.6.16 Supply earthing lugs

5.3.6.17 Supply anchor bolts, nuts and washers

5.3.6.18 Supply nameplate with bracket

5.3.6.19 Supply spares for start-up, erection and commissioning

5.3.6.20 Supply pickling, cleaning and passivation

5.3.6.21 Supply list of recommended spares for two (2) years
operation5.3.6.22 Supply any additional items required and specified on the
mechanical datasheet

5.3.6.23 Supply special tools (if required)

5.3.7 Alum DAF Dosing Pump (3290-Y-005-P19, R)5.3.7.1 Supply two (2) complete sets of pumps including motors,
piping and accessories.

5.3.7.2 Drawings and documentations as required and requisition

5.3.7.3 Guarantees for mechanical design, materials,
workmanship, etc.5.3.7.4 If required, CONTRACTOR shall provide and include
pulsation dampener at pump suction and discharge in
scope of supply.5.3.7.5 The pump shall be performed inspection and test in
accordance with specification no. ES-95.11 and ES-99.03.5.3.7.6 Supply and install calibration columns (2 nos. for 2
pumps)



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

5.3.7.7 Supply spares for start-up, erection and commissioning

5.3.7.8 Supply list of recommended spares for two (2) years operation

5.3.7.9 Supply any additional items required and specified on the mechanical datasheet

5.3.7.10 Supply special tools (if required)

5.3.8 An-Polymer Dosing Pump for DAF Process (3290-Y-006-P02, R),

5.3.8.1 Supply two (2) complete sets of pumps including motors, piping and accessories.

5.3.8.2 Drawings and documentations as required and requisition

5.3.8.3 Guarantees for mechanical design, materials, workmanship, etc.

5.3.8.4 If required, CONTRACTOR shall provide and include pulsation dampener at pump suction and discharge in scope of supply.

5.3.8.5 The pump shall be performed inspection and test in accordance with specification no. ES-95.11 and ES-99.03.

5.3.8.6 Supply and install calibration columns (2 nos. for 2 pumps)

5.3.8.7 Supply spares for start-up, erection and commissioning

5.3.8.8 Supply list of recommended spares for two (2) years operation

5.3.8.9 Supply any additional items required and specified on the mechanical datasheet

5.3.8.10 Supply special tools (if required)



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

5.3.9 MBR Permeate Transfer Pump (3290-P-017, R)

- 5.3.9.1 Remove existing MBR Permeate Transfer Pumps two (2) sets
- 5.3.9.2 Supply two (2) complete sets of pumps including motors, piping and accessories.
- 5.3.9.3 Drawings and documentations as required and requisition
- 5.3.9.4 Guarantees for mechanical design, materials, workmanship, etc.
- 5.3.9.5 Pumps shall be performed inspection and test in accordance with specification no. ES-95.09 and ES-99.03.
- 5.3.9.6 Supply spares for start-up, erection and commissioning
- 5.3.9.7 Supply list of recommended spares for two (2) years operation
- 5.3.9.8 Supply any additional items required and specified on the mechanical datasheet
- 5.3.9.9 Supply special tools (if required)

5.3.10 Rotating and Packaged Equipment

- 5.3.10.1 CONTRACTOR shall study the rotor dynamic analysis (lateral and torsional) and prepare report to submit to PTT. Speed torque curve, new lube oil set points, new vibration set point, and etc. shall be verified by CONTRACTOR.
- 5.3.10.2 The Contractor shall provide and response for machinery alignment report (Chart) for complete train. Contractor shall design foundation for new baseplate for compressor



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

train. However, CONTRACTOR shall foresee the space to access for operation and maintenance of each train.

- 5.3.10.3 Not later than 3 months prior to the planned READY FOR START-UP date of compressor UNIT, CONTRACTOR shall supply to PTT lists of lubricating oils and greases required for the operation of rotating equipment, etc. CONTRACTOR shall standardize and limit as far as possible, the grades of lubricating oils and greases required to operate the UNIT to those currently used by PTT to operate PTT's EXISTING FACILITIES.
- 5.3.10.4 All of lube oil system (such as pipes, pumps, valves, and fitting) where contact with oil (both working oil & lubrication oil) shall be Stainless Steel according to PTT Engineering Standard (ES-30.03).
The On-Site Chemical Flushing for all of lube oil systems shall be done by the CONTRACTOR at SITE. The cleanliness acceptance criteria have to follow the international standard or manufacturer standard.
- 5.3.10.5 CONTRACTOR shall carry out a site test on the compressor anti-surge control system.
- 5.3.10.6 Reducers immediately connected to the pump suction shall not exceed one pipe size change.
- 5.3.10.7 Special tools shall be provided with dimensional DRAWINGS.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

5.3.10.8 All pumps including driver and associated instrumentation shall be suitable for the Electrical Hazardous Area Classification.

5.3.10.9 Supervisor for compressor installation shall have experience and pass PTT interview and qualification.

5.3.10.10 CONTRACTOR shall provide steel frame support for Local Control Panel (LCP) of all COMPRESSOR.

5.3.10.11 CONTRACTOR shall install demister of existing Remaining Gas Knock Out Drum (5590-D-002)

5.3.10.12 CONTRACTOR shall install demister with removal efficiency at least 99% of 5 micorn droplet

5.4 Civil and Structural Engineering

5.4.1 General

5.4.1.1 Site preparation and drainage plan

Site preparation shall generally be accordance with Engineer Standards (ES-40.01: Specification for Civil Work and ES-40.01.04: Specification for Site Preparation). The SITE level shall be brought to a sufficient elevation to avoid flooding by rain run-off water. SITE level shall allow constructing an efficient storm water drainage system for rapid evacuation of the run-off water. The SITE fill shall be made of suitable selected and compacted material.

Prior to fill works the entire SITE needs to be cleared of all vegetation, organic soil, other obstacles and existing



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

construction unless otherwise approved by the Owner.

CONTRACTOR shall demolish or relocate all existing equipment at construction area e.g. compressor packages, pressure vessels, steel structure including underground facility.

5.4.1.2 Soil investigation

CONTRACTOR shall perform soil boring test and soil investigation report for each equipment's foundation, to obtained design soil parameters for design of foundations for dynamic equipment, especially dynamic soil shear modulus, poisson's ratio , and soil damping.

5.4.1.3 Underground facility verification work

All underground works shall be conformed with PTT underground verification regulation.

5.4.1.4 Earth work

Refer to ES-40.01

5.4.1.5 Reinforced Concrete Work

All concrete structures shall be followed ES-40.01 Specification for Civil Work and ES-40.11 Design of Machine Foundations.

5.4.1.6 Piling Work

Refer to ES-40.01.02

5.4.1.7 Road and Paving

Roads and paving area shall generally be accordance with Engineer Standards (ES-40.01: Specification for Civil



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

Work and ES-40.12: Specification for Road and Paving.).

The road and paving area are required to allow for access to all parts of the Plant during construction and subsequently during normal operation and maintenance periods. The width and the carrying capacity of the particular road section shall be designed based on the expected maximum weight and size of the components or materials to be delivered to or sent out from the Plant. Temporary arrangements enabling the transportation of heavy equipment to the SITE during the construction period are allowed. However, permanent arrangements are required to the extent that e.g. the replacement of heavy components, such as the compressor-electrical motor-gear box, will be possible throughout the life-cycle of the Plant.

The roads and paving area shall be designed to be capable of carrying all kind of vehicles to be used during construction and operation all roads shall be provided with concrete pavement.

5.4.1.8 Oily and storm drainage work

Refer to ES-40.13.

5.4.1.9 Fire proof work

Refer to ES-92.05.

5.4.1.10 Fire stop

For cable laying through a wall of buildings or between



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

floor of building, CONTRACTOR shall install them with fire stop material to withstand fire more than 2 hours.

5.4.1.11 Steel structure work

Refer to ES-40.07 and ES-40.08

All supporting steel structures shall be provided for the ducting, pipe work and galleries, including pipe support brackets. Suitable allowance shall be made in the supporting of piping and ducting for thermal expansion and in the choice of anchor points to avoid thermal stressing of the structures.

Steel work in close proximity with hot air or gas or subject to radiation from any part of the Plant shall be adequately protected and insulated by ES-92.01 Hot Insulation.

CONTRACTOR shall supply and install step ladder for compressor packages.

5.4.1.12 Painting

The steel structure shall be coated by following ES-92.06 Painting.

5.4.1.13 Typical Drawing

Refer to typical drawing in attachment 11.

5.4.2 New Electrical Motors-Gas Compressor Foundations and Other Structures Requirements

The design and construction will aim to provide equipment and foundation



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

structures with the minimum required service life of 50 (fifty) years and at least 2 (two) years of uninterrupted operation.

New electrical motors-gas compressor foundation works, including but not confined to, the following:

- CONTRACTOR shall design and construct all equipment foundation such as compressor, drum, steel structure.
- Preliminary works, additional surveys, and all associated operations
- Soil investigation report, to obtained design soil parameters for design of foundations for dynamic equipment, especially dynamic soil shear modulus, poisson's ratio , and soil damping.
- At least 1 (one) static pile load test shall be provided to obtain pile capacity for design of foundations of each dynamic equipment.
- Dynamic foundation analysis by using the reliable finite element software such as ANSYS , NASTRAN , ALGOR , ABAQUS , SACS , GTSTRUDL , RISA , SAP2000 , DYNA , STAAD PRO , or equivalent.
- Professional Engineers who perform dynamic foundation analysis according to ACI 351.3R-04 "Foundations for Dynamic Equipment", American Concrete Institute
- SITE clearing, removal of obstructions and organic materials.
- SITE preparation, cut, fill and compaction
- The temporary braced sheet pile wall system for excavation works.

The design of new electrical motors-gas compressor foundations shall be in accordance with the following standards, codes of practice and statutory legislation as shown in section: Nation/International Standards, and



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

Engineering Standards.

Engineering Standards

- ES-40.01 : Specification for Civil Work
- ES-40.01.01 : Specification for Precast concrete Piling
- ES-40.01.02 : Specification for Cast In-Situ Concrete Bored Piling Work
- ES-40.01.04 : Specification for SITE Preparation
- ES-40.05 : Wind and Earthquake Loading
- ES-40.06 : Design Loading
- ES-40.07 : Structural Steel Work Design
- ES-40.08 : Structural Steel Fabrication and Erection
- ES-40.09 : Design of Concrete Foundation Structures and Paving
- ES-40.11 : Design of Machine Foundations
- ES-40.12 : Specification for Road and Paving
- ES-40.13 : Drainage Design

Any conflicts between Engineer Standards and Nation/International Standards shall be referred to National/International Standards for judgment.

5.4.3 New MCC Panel in OCS1 Substation

To be scope of CONTRACTOR to modify the existing available space in 2nd floor of OCS1 substation for installing new MCC panel. The details for installation and location shall be referred in attachment 4.

5.5 Instrumentation and Controls

The general requirements for the instrumentation and control systems are specified in the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

Instrument and Control Philosophy PH-60-01 in the attachment. Further requirements are stated below.

5.5.1 CONTRACTOR shall ensure that all new field instruments are suitable for installation in the hazardous area identified at its location. The following symbol and numbering convention have been used on the P&IDs to identify the various instrument systems.

5.5.1.1 DCS – standard bubble symbol

5.5.1.2 SIS – interlock diamond with 2xxx reference (safety PLC)

5.5.2 CONTRACTOR shall be responsible for identifying all existing plant DRAWINGS that are affected by CONTRACT and updating them. This includes but is not limited to updating of existing wiring and termination schedules, Instrument Loop DRAWINGS. Where modification is required to any existing control system the CONTRACTOR shall provide all necessary configuration including graphics and software to meet the CONTRACT requirements.

5.5.3 CONTRACTOR shall make a modification to existing YOKOGAWA CENTRUM VP DCS system, marshalling cabinet and software to meet the required control and monitoring functionality as specified in Engineering Standard ES-60.05: Distribution Control System Specification and PH-60.01: Control Philosophy including all necessary communication links, associated software and configuration.

5.5.4 CONTRACTOR shall make a modification to the existing YOKOGAWA PROSAFE RS PLC, marshalling cabinet and software to meet the required control, monitoring functionality and all necessary communication links as specified in Engineering Standard ES-60.02: Emergency Shutdown



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

System. Instrumented Safety systems shall be designed according to the principles of IEC 61508. Each Safety Function shall be allocated a Safety Integrity Level (SIL) and the system architecture and components designed to meet the allocated SIL. A specific SIL review shall be undertaken to allocate SIL's to each safety function and shall be based on the demand frequency and consequences of failure of the safety function. A Reliability Calculation report shall be provided to demonstrate the achievement of the required SIL.

- 5.5.5 CONTRACTOR shall provide a new UCP for AOP Package located inside AOP shelter. The new UCP shall be an Allen-Bradley PLC system and shall be able to receive hardwire ESD signal from the existing CWWTP Central PLC system. The marshalling cabinet and additional shall connect/modify to the existing CWWTP PLC system, including all necessary communication links to PLC and DCS system, associated software and configuration for implementing the required control and monitoring functionality as specified in Engineering Standard ES-60.05: Distribution Control System Specification and PH-60.01: Control Philosophy.

New UCP for AOP Package shall install on new baseplate.

- 5.5.6 CONTRACTOR shall develop FactoryTalk graphics for new main equipment and instrument at CWWTP as per P&ID.

- 5.5.7 Where new signals to/from the control systems of the EXISTING FACILITIES,

- 5.5.7.1 CONTRACTOR shall provide the new junction box and all related accessories.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

5.5.7.2 CONTRACTOR shall provide new single cable for all field instrument and multi-pair/multi core between each junction box to the existing control buildings. All outdoor instrument signal cables shall be armored and be routed within an above ground cable tray system. The specification of control cable is specified in Engineering Standard ES-60.10 : Specification for Instrumentation Cables.

- 5.5.8 CONTRACTOR shall extend the existing cable routing system if the existing not enough.
- 5.5.9 CONTRACTOR may use spare capacity in existing instrument cable tray subject to the approval of PTT.
- 5.5.10 CONTRACTOR shall perform site surveys to verify spare space is available to accommodate new cables. If spare space is not available, a new cable tray shall be provided by the CONTRACTOR.
- 5.5.11 To lay instrument cable through a wall of the buildings, CONTRACTOR shall lay them through cable transit. In case that the existing cable transit have not enough spare holes, CONTRACTOR shall install new cable transit.
- 5.5.12 CONTRACTOR shall provide an Emergency Shutdown System and a Protective Instrument System in accordance with ES-60.02: Emergency Shutdown System Specification
- 5.5.13 CONTRACTOR shall provide detailed test procedures covering the routine testing required during the life cycle of the UNIT to maintain the required SIL for each Safety Function.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

- 5.5.14 CONTRACTOR shall provide The analyzer in accordance with ES-60.08 : Analyzer sampling system specification.
- 5.5.15 CONTRACTOR shall develop DCS graphics for new main equipment and instrument as per P&ID. And Modbus communication between main equipment and DCS.
- 5.5.16 CONTRACTOR shall develop DCS graphics for anti-surge control graphs with function to reset surge margin and function to be able to manual command surge valve for all main equipment.
- 5.5.17 CONTRACTOR shall develop SYSTEM1 machine monitoring system to monitor vibration of main machine and air-cooled heat exchanger. CONTRACTOR shall configure communication link of vibration between main machine's UCP and existing plant SYSTEM1.
- 5.5.18 CONTRACTOR shall develop the shutdown logic for, and incorporate the following signals:
- 5.5.18.1 All motors fed from medium voltage supply shall have motor winding temperature protection to trip the motor on high temperature.
- 5.5.18.2 All air-cooled heat exchangers shall be furnished with vibration transmitters fitted to the fan bearing housing and the motor casing, to trip the motor on high vibration.
- 5.5.19 Where fields Instruments or control system or marshaling cabinet are identified for disinvestment on the demolition P&ID's or layout plan
- 5.5.19.1 For Instrument air tank at GSP2 area. The field instrument including with DCS and SIS shall be removed from it's process connection in it's entirety if it is not being



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

relocated. This shall include removal of all cabling, process tubing, air tubing, supports, cabling, cable tray and any other associated field hardware. Any existing piping or tubing that is disconnected, i.e., air headers, shall be sealed with a suitable plug or blind. Field cabling shall be removed from the instrument to the field instrument junction box. Spare cable entries into instrument junction boxes shall be sealed with a suitable plug, rated for the relevant hazardous area classification. The cores of multi-core cables that are part of the disinvestment scope shall be relabeled as spare at both the field instrument junction box and the instrument rack room marshalling or system cabinet. System cross wiring shall remain in place, but all cable markers and associated labels shall be relabeled as spare. The configuration of the system or sub-systems to which the instrument is connected shall be modified to fully remove the disinvested instrument. All relevant instrument drawings shall be updated to reflect the as-built status of the disinvestment. The extent and location of application shall be agreed during detailed engineering.

- 5.5.19.2 For existing UCP of Regeneration Gas Compressor (Tag 3302C01) inside GSP3 substation. The control system, control system cabinet and marshalling cabinet shall be removed from its location and handed over to PTT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

Before removing a UCP panel, CONTRACTOR shall disconnect all signal cable and power cable.

CONTRACTOR shall remove all cabling and any other associated hardware to be able to install the new panel.

Any existing cable shall be disconnected from the terminal and relabeled. All relevant instrument drawings shall be updated to reflect the as-built status of the disinvestment. The extent and location of application shall be agreed during detailed engineering.

- 5.5.20 CONTRACTOR shall relocate control valve 5590-LV-003 and shutoff valve 5590-XV-005 including new platform to reduce length between valve and heat exchanger according to attachment 4.
- 5.5.21 CONTRACTOR shall verify size of existing control valves and bypass valves of 5590-E-004 (WP4).
- 5.5.22 Due to the scope of the project relating to the modification of the existing plant, CONTRACTOR shall conduct a tie-in point for Instrument systems e.g., circuit breaker at power distribution panel or UPS panel, ESD tie-in point or PLC/Sub-system communication tie-in port with the existing plant during the turnaround or shutdown period for New Regeneration Gas Compressor systems of GSP2, GSP3 and New Refrigeration system for Remaining Gas treatment (RGT).
- 5.5.23 CONTRACTOR shall install Anti-surge valve, Anti-surge instrument and all it's accessory.

5.6 Electrical Engineering



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

5.6.1 Refrigerant compressor Unit

The UNIT shall receive the electrical power source from OCS1 Substation at 11.5kV level. CONTRACTOR shall be responsible for delivering a completed design for the Electrical Power and Distribution system for the UNIT in accordance with the PROJECT SPECIFICATION and shall be integrated with and complement the existing system. The scope of electrical work shall be at least but not limited to as following

- 5.6.1.1 Install and Commissioning MV motor and its auxiliary system including with Liquid Rheostat and Secondary Control Panel
- 5.6.1.2 Supply all power and control cable including with other bulks material such as cable gland, cable mark, MV Terminator kits and other equipment for all Electrical equipment as Attachment 4.
- 5.6.1.3 Install all power and control cable as cable routing in Attachment 4 which specified in PTT's Typical installation for all Electrical equipment as Attachment 11.
- 5.6.1.4 Supply and Install the local control station (LCS)
- 5.6.1.5 Supply and Install the New MCC Panel as Single line diagram in Attachment 4.
- 5.6.1.6 Supply and Install the extension C&S including with the scope of work to modify the graphic of MV motor, liquid rheostat, New MCC Panel and LV motors to show on the existing C&S panel.

The extension C&S panel shall compose of new I/O Rack,



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

Digital Input Cards, Digital Output Cards, Analog Input Cards, Analog Output Cards, Controlnet interface module, chassis rack, chassis power supply.

The extension C&S panel shall be linked with the existing system via controlnet cable. All new electrical loads shall be shown in C&S panel by using the same system architecture as the existing panel as detail in Attachment. Essential parameters such as current, voltage, Watt, Var, kWh, Running Hour shall be linked with the MCC and Switchgear to show on the C&S.

- 5.6.1.7 Modify existing C&S of ESP substation as detail below
- Backup and verify existing C&S at ESP
 - Engineering include concerned document to add MV load to C&S at ESP (Use existing Modbus Communication module)
 - Modify of program and graphic for add New Load to C&S at ESP
 - Update and download modification program and graphic to existing C&S at ESP
 - Commissioning test
- 5.6.1.8 Modify existing C&S of ROCS1 substation as detail below
- Supply AB Controllogix digital Input module IB32 with Connector (use existing IO Rack) 2 EA
 - Supply AB Controllogix serial Communication SST (use



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

existing IO Rack) 1 EA

- Supply Terminal and accessories for internal wiring at 310-AN-02 panels 1 Lot
- Backup and verify existing C&S at ROCS1
- Engineering include concerned document to add MV and LV loads to C&S at ROCS1 (by hardwired signal for SWGR/MCC panel and by Modbus RTU for Protection relay and Multimeter) Essential parameters such as current, voltage, Watt, Var, kWh, Running Hour
- Modify program and graphic for MV and LV loads to C&S at ROCS1
- Update and download modification program and graphic to existing C&S at ROCS1
- Commissioning test

5.6.1.9 Connect New MV Motor Signal to existing PMS System (Power management system) in Load shedding function as detail below

- Backup and verify existing PMS
- Engineering include concerned document to add 1 Sheddable load to PMS (Use existing spare IO channel of Remote IO station at ROCS1 substation)
- Modify of Loadshedding program and graphic for add 1 Sheddable Load to PMS (SLSC-ESP Controller)
- Update and download modification program and graphic



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

to existing PMS

- Commissioning test

5.6.1.10 Supply and Install additional protective relay of MV motor as specified in single line diagram in Attachment which composed with

- Motor Protection Relay

- New Current Transformer

- New Transducer for PMS System

Protection relay for MV Switchgear shall be the same Vendor with the existing Panel

5.6.1.11 Supply and Install New Power Energy meter with at least the following details

- Self power supply or 220Vac, 110Vdc

- Current Input 1A or 5A

- PT Input 110Vac

- Standard IEC 62052-11

- Communication protocol RS485. The new communication cable shall be connected multi drop method from nearby Existing panels

5.6.1.12 Provide suitable relay protection setting and testing to MV Switchgear and MCC as PTT's engineering specification.

5.6.1.13 Connect the new MV motor signal and wiring with PMS (Power Management System) until completing modified any signals, Programs, Graphic, and function test.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

5.6.1.14 Supply and Install new grounding then connect to the existing earthing grid.

5.6.1.15 Supply and Install new lightning protection and new grounding for new equipment area then connect to the existing grounding system

5.6.1.16 Supply and Install Paging intercom and CCTV to cover the new process area

5.6.1.17 Supply and Install Lighting fixture and socket outlet in the new process area

5.6.1.18 Supply and Install Explosion proof power plug 3P 400V 60A

5.6.1.19 Supply and Install Explosion proof power plug 2P 230V 16A

5.6.2 Regenerator compressor GSP2,3

The UNIT shall receive the electrical power source from GSP3 Substation at 6.9kV level. CONTRACTOR shall be responsible for delivering a completed design for the Electrical Power and Distribution system for the UNIT in accordance with the PROJECT SPECIFICATION and shall be integrated with and complement the existing system. The scope of electrical work shall be at least but not limited to as following.

5.6.2.1 Install and Commissioning MV motor and its auxiliary system including with Liquid Rheostat and Secondary Control Panel



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

- 5.6.2.2 Supply all power and control cable including with other bulks material such as cable gland, cable mark, MV Terminator kits and other equipment which specified in PTT's Typical installation
- 5.6.2.3 Install all power and control cable as cable routing in Attachment which specified in PTT's Typical installation
- 5.6.2.4 Supply and Install the local control station (LCS)
- 5.6.2.5 Modify the existing LV MCC Spare modules to suit motors and other electrical equipment and system. New protective and control module, circuit breaker and other accessories of LV MCC spare modules shall be provided and replaced. New LV MCC shall be provided and installed/ tied-in in available space without any interruption to the existing plant operation.
- 5.6.2.6 Supply and Install New Fuse for Existing Vacuum Magnetic contractor of Regeneration GSP2 at GSP3 Substation (New Fuse shall be suitable with Existing VMC without modification)
- 5.6.2.7 Connect New MV Motor Signal of Regeneration compressor GSP2,3 to existing PMS System (Power management system) in Load shedding function as detail below
- Supply New remote IO panel that connected with existing PMS at GSP3 Substation
 - Supply ABB CI840 Profibus Slave module for Remote



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

IO Station 2 EA

- Supply ABB TU847 Profibus Slave base module for 2xCI840 1 EA
- Supply ABB AI810 with Terminal base unit 1 EA
- Supply ABB DI810 with Terminal base unit 1 EA
- Supply ABB DO820 with Terminal base unit 1 EA
- Supply Fiber Optic converter for Profibus DP 2 EA
- Supply Redundant Power supply 24VDC 10A 1 EA
- Supply Fiber optic patch panel 12 core, FO patch cable and accessories 1 Lot
- Install and commissioning remote IO Panel

5.6.2.8 Modify Existing PMS at IPG Substation as detail below

- Supply Fiber Optic converter for Profibus DP 2 EA
- Supply Fiber optic patch panel 12 core, FO patch cable and accessories 1 Lot
- Backup and verify existing PMS
- Engineering include concerned document to add new Remote IO at GSP3 and 2 Sheddable load to PMS
- Modify of Loadshedding program and graphic for add 2 sheddable Load to PMS (MLSC Controller)
- Update and download modification program and graphic to existing PMS
- Commissioning test

5.6.2.9 Supply and Install additional protective relay of Regeneration GSP2,3 at GSP3 Substation as specified in



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

single line diagram in Attachment which composed with

- New Current Transformer
- New Transducer for PMS System

Protection relay of MV Switchgear shall be the same

Vendor with the existing Panel

- 5.6.2.10 Supply and Install New Power Energy meter for
Regeneration GSP2,3 at GSP3 Substation with at least the
following details
- Self power supply or 220Vac, 110Vdc
 - Current Input 1A
 - PT Input 110Vac
 - Standard IEC 62052-11
 - Communication protocol RS485. The new
communication cable shall be connected multi drop
method from nearby Existing panels
- 5.6.2.11 Provide suitable relay protection setting to MV
Switchgear and MCC as PTT's engineering specification
- 5.6.2.12 Connect the new MV motor signal and wiring with
Existing PMS (Power Management System) until
completing modified any signal, graphic, and function
test. Recheck with existing (wait engineering from
vendor)
- 5.6.2.13 Supply and Install new grounding then connect to the
existing earthing grid.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

- 5.6.2.14 Supply and Install new lightning protection and new grounding for new equipment area then connect to the existing grounding system
- 5.6.2.15 Supply and Install Paging intercom and CCTV to cover the new process area
- 5.6.2.16 Supply and Install Lighting fixture and socket outlet in the new process area

5.6.3 WP2: Comprehensive Wastewater Treatment Plant (CWWTP) Modification

- 5.6.3.1 Supply, Install and Commissioning LV motor and its auxiliary system
- 5.6.3.2 Supply all power and control cable including with other bulks material such as cable gland, cable mark, and other equipment which specified in PTT's Typical installation
- 5.6.3.3 Install all power and control cable as cable routing in Attachment which specified in PTT's Typical installation
- 5.6.3.4 Supply and Install the local control station (LCS)
- 5.6.3.5 Modify the existing LV MCC Spare modules to suit motors and other electrical equipment and system. New protective and control module, circuit breaker and other accessories of LV MCC spare modules shall be provided and replaced.
- 5.6.3.6 Provide suitable relay protection setting to LV Switchgear and MCC as PTT's engineering specification



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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- 5.6.3.7 Modify the existing CWWTP Substation's C&S program and graphic HMI to suit motors and other electrical equipment and system. Essential parameters such as current, voltage, Watt, Var, kWh, Running Hour shall be linked with the Switchgear to show on the C&S.
- 5.6.3.8 Supply and Install new grounding then connect to the existing earthing grid.
- 5.6.3.9 Supply and Install new lightning protection and new grounding for new equipment area then connect to the existing grounding system
- 5.6.3.10 Supply and Install Paging intercom and CCTV to cover the new process area
- 5.6.3.11 Supply and Install Lighting fixture and socket outlet in the new process area

CONTRACTOR shall fully develop the electrical DRAWINGS provided in the PROJECT SPECIFICATION to take account of the final document. Electrical System analysis shall include, but is not limited to the following:

- Short Circuit Calculation
- Load Flow and Voltage Drop Studies
- Reacceleration blocks & timing studies
- Large Motor Starting study
- System Harmonic Analysis



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

- Protection devices setting and coordination study

Power system study and calculation shall be performed by ETAP Version 16.2 program. Reports of power system study shall be submitted both hard-copy and soft-copy. Source program of ETAP for the power system calculation shall be provided in hard disc drive as minimum.

CONTRACTOR shall undertake Short Circuit Calculation, Load Flow and Voltage Drop Studies and Large Motor Starting study. Large Motor Starting study shall be done in both static and dynamic modeling by using final VENDOR data as basis for studies as required in the PROJECT SPECIFICATION.

CONTRACTOR shall fully develop electrical Protection co-ordination as required in the PROJECT REQUIREMENTS. CONTRACTOR shall be responsible to devise & allocate protection scheme, identify relay characteristic, model system on software which data input to account for final VENDOR data and produce Protection Study and schedule.

CONTRACTOR shall fully develop electrical document and drawing which shall be at least but not limited to as following.

- Electrical single line diagram, protection and metering



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

diagram and MCC one line schedule provided in the PROJECT REQUIREMENTS to account for final design development.

- The Area classification drawing according to API RP 500 latest revision. The final process data sheet, plot plan, layout, design development and equipment installation shall meet minimum Hazardous Area Requirements defined in ES-70.01: Electrical & Telecommunication Standard. CONTRACTOR shall modify area classification drawings of the EXISTING FACILITIES if necessary.
- Electrical load balance schedule and calculation and power cable selection basis study as required in the PROJECT REQUIREMENTS to account for design development.
- Calculation for Current Transformer Accuracy Limit Factor as required in the PROJECT REQUIREMENTS to account for design development.
- Electrical overall cable schedule and drum schedule as required in the PROJECT REQUIREMENTS to account for design development.
- Electrical Schematic and wiring diagrams as required in the PROJECT REQUIREMENTS to account for design development.
- Electrical equipment datasheet as required in the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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PROJECT REQUIREMENTS to account for design development.

- Electrical Material Requisitions as required in the PROJECT REQUIREMENTS to account for design development.
- Plant grounding system as required in the PROJECT REQUIREMENTS. CONTRACTOR shall extend the plant grounding system where required to ensure that all new electrical equipment, and all non-electrical conducting surfaces are correctly bonded to earth. All the system shall be connected to the new/ existing ground loops refer to PROJECT REQUIREMENTS.
- Plant lightning protection system as required in the PROJECT REQUIREMENTS. CONTRACTOR shall extend the lightning protection system where required to ensure that all new equipment such as Storage Tank are correctly protected. All lightning protection system shall be connected to the new/ existing ground loops refer to PROJECT REQUIREMENTS.
- Plant lighting system as required in the PROJECT REQUIREMENTS. CONTRACTOR shall extend the lighting system as required, to ensure correct illumination levels in and on new equipment areas in accordance with PROJECT REQUIREMENTS. New lighting panels (if required) shall be provided and installed at the new



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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MR. NATTAPONG KOCHAKARN

MR. TANUPAT WONGTAPHA

MR. PANUWAT TOHSAKUL

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SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

process area. The existing PDP/EDP panel shall be utilized to supply the lighting panel at site.

- Electric Cathodic Protection System Layout

Drawings/Schedules as required in the PROJECT REQUIREMENTS to account for design development. Cathodic Protection System shall be designed, supplied and installed by CONTRACTOR as per PROJECT REQUIREMENTS. (Underground fire water piping system, oily waste water, etc.)

CONTRACTOR shall be responsible for verify, design, construction EXISTING FACILITIES for the electrical power supply system, grounding and lightning system, lighting system.

CONTRACTOR shall be responsible for identifying drawings of any EXISTING FACILITIES that are affected by the CONTRACT and updating them. This includes but is not limited to updating of existing layout drawings, load balance and load list, main cable route, power and control layout, wiring and termination schedules, schematic diagram etc.

CONTRACTOR shall ensure that all new equipment is suitable for installation in the hazardous area classification. CONTRACTOR shall be responsible for replacement and relocation of the EXISTING equipment



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

to ensure that all equipment is suitable for the hazardous area classification.

CONTRACTOR shall ensure that all equipment and structures are correctly protected from lightning.

CONTRACTOR shall ensure that all new equipment is suitably installed and all power cables are installed with safety clearance, such that there is no interference to instrument equipment and instrument cable.

CONTRACTOR shall be responsible for Refurbish or Overhaul the EXISTING electrical equipment, for instance, Motor, MV Switchgear, LV MCC and etc. that are utilized for this PROJECT

EXISTING, both under and above ground, electrical equipment and etc which are obstructed the PROJECT shall be relocated. CONTRACTOR shall be responsible for verification, design development and modification work.

CONTRACTOR shall consider utilizing the energy-saving electrical equipment for the PROJECT, such as, LED lighting fixture.

CONTRACTOR shall monitor and record current, voltage, power factor and active power corresponding to pump performance curve during performance testing.

CONTRACTOR shall provide of all material, supervisory personnel for motor, switchgear, C&S and required



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

electrical equipment for the PROJECT during pre-commissioning through to INITIAL ACCEPTANCE. Local authorized service shall be preferably provided. PTT reserves the right to refuse electrical engineering team or personnel who has insufficient manpower and less experience for the project.

5.7 Communication Systems

CONTRACTOR shall provide communication systems in the PROJECT in accordance with Engineering Standard ES-70.01: Electrical & Telecommunication Standard. The new communication systems shall be compatible with and integrate into the existing systems used in the EXISTING FACILITIES. The location and number of CCTV, loudspeakers and telephones will be proposed by CONTRACTOR during detailed engineering and subject to agreement by PTT with no cost to PTT.

CONTRACTOR shall fully develop electrical communication system and layout as required in the PROJECT REQUIREMENTS to account for design development.

CCTV, loudspeakers and telephones for new process area shall be connected to the existing system. Any modification work or additional equipment shall be CONTRACTOR's responsibility with no cost to PTT.

5.8 Fire and Gas Systems

CONTRACTOR shall provide Fire and Gas Detection systems in the new process area and where necessary, extend the existing system in accordance with ES-90.03: Fire & Detection and Protection Specification. The design of the new and extended systems shall be compatible with and integrate into the existing system used in the EXISTING FACILITIES



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

and the types of components used shall be identical to those in the EXISTING FACILITIES unless otherwise agreed by PTT. CONTRACTOR shall be responsible for all modifications to the existing Fire and Gas Detection system control panel, status panel, software, and all communication to DCS or other systems in association with the integration of the new and extended systems.

5.9 Fire Fighting Systems

CONTRACTOR shall design the equipment by following ES-90.03. CONTRACTOR shall supply and install firefighting and fire extinguisher equipment as specified in Attachment 4. After installation firefighting equipment such as fire monitor, spray nozzle, CONTRACTOR shall test to confirm equipment functional as design.

5.10 Noise

The noise limitation requirements are given in ES-90.06: Health Safety and Security Specification, and ES-91.01: Equipment Noise Specification.

6 PROCUREMENT EXECUTION REQUIREMENTS

6.1 General

6.1.1 SCOPE OF WORK

CONTRACTOR shall procure and deliver to SITE all the equipment and materials required for the WORK. CONTRACTOR shall provide all the procurement services necessary for the efficient accomplishment of the WORK. The procurement services include all activities required to perform purchasing, expediting; inspection, payment, shipping, customs clearance,



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

other related activities in connection with the purchase and delivery of equipment and materials required for the CONTRACT.

6.1.2 Management

CONTRACTOR shall appoint a Project Procurement Manager to liaise on all procurement matters between CONTRACTOR's organization and PTT. CONTRACTOR shall submit procurement plan for all equipment and subcontractors/vendors to PTT for approval. The procurement status shall be reported in project monthly meeting. In case the procurement status delay from plan, CONTRACTOR shall report the procurement status instead.

6.1.3 Purchasing Policy

Equipment and materials shall be purchased ONLY from any approved worldwide source on the PTT's VENDOR LIST within the limitations of Thai import restrictions and with consideration for quality, delivery, reliability, service and public and environmental safety subject to the terms of the CONTRACT.

6.2 **VENDOR and Subcontractor List**

6.2.1 VENDOR LIST

The VENDOR LIST provides a list of VENDORS that are acceptable to PTT for the particular product type against which they are listed. Where a product type is listed, CONTRACTOR shall only select VENDORS listed under that product type from the VENDOR LIST as in Attachment 8. PTT shall not accept any additions to the VENDOR LIST except as stated in the terms and conditions of CONTRACT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

CONTRACTOR should note that in certain cases there may be a restriction on country of origin of equipment and materials from a particular VENDOR.

7 CONSTRUCTION EXECUTION REQUIREMENTS

7.1 General Information

7.1.1 Scope of Construction Work

CONTRACTOR shall be responsible for all WORK related to the construction of the UNIT as described in the PROJECT SPECIFICATION, in accordance with the CONTRACT

This WORK shall include, but not be limited to:

- 7.1.1.1 The receipt, transport, storage, conservation, handling and administration of all equipment and materials with special attention to hazardous material.
- 7.1.1.2 All mechanical, piping, instrument, electrical, civil and building construction and erection work, including fireproofing, insulation and painting and including all necessary fabrication and assembly work.
- 7.1.1.3 Provision of, transport, operation and maintenance of erection equipment, tools, cranes, scaffolding, temporary FACILITIES both inside and outside the SITE, consumable materials, etc, necessary for the construction.
- 7.1.1.4 Distribution of temporary utilities during construction (water, electricity, drainage, telephone).



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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- 7.1.1.5 Inspection, testing, flushing, drying, running in and all activities up to READY FOR START-UP.
- 7.1.1.6 Provision of all necessary management, supervision, Labor and SUBCONTRACTORS including the arrangement of specialists or VENDOR's assistance.
- 7.1.1.7 Planning, scheduling and progress control of the construction work, in accordance with the agreed PROJECT EXECUTION PROPOSAL.
- 7.1.1.8 Administrative services and reporting necessary for a proper control of the construction work.
- 7.1.1.9 Provision of offsite temporary FACILITIES and site office.
- 7.1.1.10 Commissioning of the UNIT as defined in this PROJECT SPECIFICATION.
- 7.1.1.11 Provision of VENDORS' personnel as required for pre-commissioning and Commissioning of the UNIT, at CONTRACTOR's cost.
- 7.1.1.12 Underground piping, ducts, manholes and pits for electrical and control instrument systems, earthing, lightning protection, roads and paved areas, SITE surfacing, landscaping and Access road to the UNIT.
- 7.1.1.13 Site preparatory work
- 7.1.1.14 Site underground verification work
- 7.1.1.15 Provision new skid base with Compressor, motor, auxiliary system (complete set)



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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- 7.1.1.16 Compressor Alignment
- 7.1.1.17 Installation of Dry Gas Sealed System
- 7.1.1.18 Modification of piping work
- 7.1.1.19 Relocate and Construct new foundation for Instrument air surge tank of GSP2. The scope of work shall include lifting work from existing location and install to new location as specified in the drawing attachment 4.
- 7.1.1.20 Civil and architectural works including piling and foundations for equipment, foundations and structures for the new electric motor and Compressor Skid, Air Cooler and all other equipment.
- 7.1.1.21 Connection 11.5kV MV cable for MV motor and 400V for auxiliary motor to OCS1 substation to substation as specific detail in attachment 4.
- 7.1.1.22 Connection CCTV, Telephone, Paging Intercom to OCS1 substation
- 7.1.1.23 Connection Gas Detection System and Fire Fighting Signal to the location that specified in attachment 4. to DPCU building
- 7.1.1.24 DCS and SIS for the FACILITIES, the measurement, open and closed loop control circuits shall be installed as the details in attachment 4.
- 7.1.1.25 Provision instrument local panels for compressor
- 7.1.1.26 Support of access steelwork and platforms, including all necessary walkways, ladders and handrails required to



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

provide convenient access for the operation, inspection and maintenance of the Plant.

7.1.1.27 Painting and surface protection requirements during and after manufacture, and at the SITE, after erection and testing

7.1.1.28 Supply of lubrication oils, grease other consumable items up to the PERFORMANCE ACCEPTANCE of the PTT requirements.

7.1.2 Onsite Temporary Facilities / Laydown

PTT allows CONTRACTOR to use area for Onsite Temporary Facilities as per requirements of Thai legislations, including toilets, rest rooms, first aid FACILITIES, medical services etc., but excluding area for fabrication. CONTRACTOR shall responsible for cost of municipal waste disposal

7.1.3 Transportation

Transportation is permitted only for the transportation of Construction Equipment, Key Personal Staff.
Number of vehicles for transportation to construction area is not more than five (5).

7.1.4 SITE Information

CONTRACTOR is required to carry out his own investigations as regards applicable local laws and regulations, conditions of labor, environmental aspects, etc. and is responsible for ensuring that all obligations in this respect are met.

7.1.5 Permits

CONTRACTOR shall be responsible for obtaining all necessary permits as



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legal required such as construction permit, plant expansion permit, test run permit, and operating permit for the WORK by providing to PTT.

The prepared applications accompanied by all the necessary DRAWINGS, engineering and construction detail, sufficient for PTT to obtain the permits. Applications to authorities for permits, etc. will be made by PTT CONTRACTOR.

CONTRACTOR is responsible for obtaining approvals from Registered Professional Engineers of DRAWINGS / documents that require such approvals under Thai Regulations.

CONTRACTOR is also responsible for obtaining the necessary Thai Professional Engineers to witness the construction and sign off of the works in accordance with Thai Regulations.

7.1.6 Personnel Labour and Subcontracts

CONTRACTOR shall ensure that adequate numbers of appropriately qualified personnel are provided at all times to meet the SCHEDULE.

CONTRACTOR shall submit to PTT his detailed plans for construction manning in terms of direct labor and/or SUBCONTRACTS, including details of the scope and type of each proposed SUBCONTRACT.

Subcontracting does not relieve CONTRACTOR of his responsibilities regarding the execution of the WORK. CONTRACTOR shall supervise and coordinate SUBCONTRACTORS employed by him and is fully responsible to PTT for the acts and/or omissions of SUBCONTRACTORS and of persons either directly or indirectly employed by them.

Nothing contained in the SUBCONTRACT documents shall create any contractual relation between any SUBCONTRACTOR and PTT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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CONTRACTOR shall respond promptly to requests from PTT to increase or decrease labor and resources to maintain schedule dates.

7.1.7 Visas and Work Permits

CONTRACTOR shall arrange for the necessary visas and work permits for him and his SUBCONTRACTOR's expatriate staff and Labor. Proper planning of the applications shall be necessary to avoid delays.

CONTRACTOR shall submit details about visas and work permits to PTT on request.

7.1.8 Personnel Registration

CONTRACTOR shall make available to PTT for information, accurate personnel registration and administration records for his own and all SUBCONTRACTOR's personnel.

CONTRACTOR's and SUBCONTRACTOR's personnel shall wear badges or other identification showing name, number and employer in Roman script.

7.1.9 SITE Security

CONTRACTOR shall submit details in accordance with CONTRACTOR's approved PROJECT EXECUTION of the security system that he proposes to organize for all matters of security on the construction area and temporary site FACILITIES.

The security system shall apply to the safe keeping of equipment and materials, tools, offices, transport, or any other items that belong to PTT, CONTRACTOR or his SUBCONTRACTORS.

7.1.10 Working Hours

The normal working week for construction shall be subject to approval by



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<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

PTT and or Thai Regulation. In the existing Gas Separation Plant Complex working hours shall follow PTT regulation.

7.1.11 Local Laws and Regulations

CONTRACTOR shall comply with the latest version of the Labor Code.

7.1.12 Vigilant measures against the spread of Coronavirus (COVID-19)

CONTRACTOR shall comply with the latest version of PTT's Vigilant measures against the spread of Coronavirus (COVID-19).

7.2 **Construction Equipment and Tools**

7.2.1 Construction Equipment

CONTRACTOR shall provide all construction equipment, cranes, tools, scaffolding, FACILITIES for transport, welding, testing, lighting, etc. necessary for a smooth and effective execution of the WORK.

All above equipment shall be in good condition, well maintained and duly protected against the environment, in order to ensure safe working conditions.

Regular inspection and testing of this equipment to the satisfaction of PTT shall be carried out and official records of these inspections shall be made available to PTT, who shall have the right for refuse the use of equipment which, in his opinion, is unsafe and/or unsuitable to perform the WORK.

All scaffolding must be manufactured to British Standards, and be erected in compliance with BS-EN 12811-1 2003 Code of Practice for Access and Working Scaffolds and to comply with ES-96.40, and special scaffold structures in steel. Scaffolding shall be inspected at weekly intervals by the authorized scaffold inspector who shall sign and date the "Scaffold Tag" after each inspection.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

CONTRACTOR shall ensure that equipment and tools employed at SITE are adequately maintained to avoid undue equipment breakdowns and tool failures that could cause erection program delays. Sufficient equipment servicing FACILITIES and spare parts should be available at SITE or in the local area.

Having obtained PTT's approval, all CONTRACTOR's construction equipment shall be removed from the SITE promptly following the completion of CONTRACTOR's work.

CONTRACTOR shall be responsible for import and export duties/taxes payable on any temporary FACILITIES or in accordance with the CONTRACT.

7.2.2 Consumable Construction Materials

CONTRACTOR shall supply handle and securely and safely store all necessary consumable construction supplies such as but not limited to: -

- All welding electrodes, oxygen, acetylene, abrasives, lubricants, cleaning compounds, solvents, sealants, etc.
- Miscellaneous hardware, such as nails, screws, plugs, clips, brackets, key plates, wedges, shim plates, assembly materials, slings, ropes, etc.
- Grease compounds and hot bolting grease.
- Pipe wrapping materials.

7.3 **Quality Assurance / Quality Control at SITE**

- CONTRACTOR shall carry out or ensure execution of the following inspections/tests on installed Equipment or Materials in the presence of PTT and inspection authorities' representatives.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

a. Inspection/tests necessary to comply with statutory requirements in connection with the granting of permits related to the construction and operation of the UNIT.

b. Inspection/tests that is required for insurance purposes.

CONTRACTOR shall carry out all field inspections/tests necessary to ensure conformity with the PROJECT SPECIFICATION and PTT's engineering specification and to prove that all equipment and materials are suited to the duties they are intended to perform. PTT representatives shall witness these tests/inspections.

CONTRACTOR shall provide proof of proper construction, as a routine check on the quality of the work, e.g. by means of samples of construction work, radiographs of welds, hydraulic testing, leak testing, earth fault testing, etc. in accordance with the PROJECT SPECIFICATION, to PTT's satisfaction.

CONTRACTOR shall arrange for the necessary testing, measuring and calibration FACILITIES.

CONTRACTOR shall arrange all supervision, certification or witnessing of construction and testing by Thai registered engineers where required by Thai law and regulations (e.g. Thai Building Act, Act Relating to Storage of Oil Fuels).

CONTRACTOR shall ensure that PTT's REPRESENTATIVEs have free access to the WORK at all times in order to enable them to exercise their rights regarding inspections of the WORK.

Inspection and/or approval by PTT's REPRESENTATIVEs shall not relieve CONTRACTOR of his responsibilities for ensuring the correctness



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

of the WORK.

If during such inspections/checks by PTT proof is given of unsatisfactory work, CONTRACTOR shall remedy these defaults immediately at no cost to PTT. In case PTT's inspection shows that more than 5% of the test specimens are faulty, they shall be entitled to reject the complete relevant construction.

Final inspecting and boxing up of equipment shall be witnessed and certified by PTT.

The presence of witnessing by PTT's REPRESENTATIVEs of any test or inspection shall in no way detract from the obligations of CONTRACTOR, who shall at all times remain fully responsible for the WORK.

CONTRACTOR shall provide reports/CERTIFICATEs of all inspections and tests in accordance with statutory, insurance party or PROJECT SPECIFICATION requirements. Where applicable, these reports shall be in a form suitable for the needs of such third parties as may be involved.

Copies of all reports shall be submitted to PTT.

7.3.2 Welding Inspection

CONTRACTOR shall be required to submit his own and any construction SUBCONTRACTORS welding procedures and procedure qualification records necessary to meet the requirements of the applicable design and fabrication codes and standards to PTT for review and agreement prior to starting mechanical work.

CONTRACTOR shall also arrange for his own and any construction SUBCONTRACTOR's welding operatives to be qualified for these procedures, prior to them performing any welding operations for the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

PROJECT, in accordance with ASME Section IX. Copies of all welder qualification CERTIFICATES shall be submitted to PTT.

PTT will inspect or arrange inspection as he deems necessary during the qualification of procedures and welding operatives, but this shall not relieve the CONTRACTOR of his responsibilities for inspection.

PTT reserves the right to require additional qualification tests during construction if he has any doubts as to the competence of welding operatives.

CONTRACTOR shall arrange for radiographic inspection of welds to be carried out by an independent third party, approved by PTT.

The radiographs shall be made according to the relevant Project Standard.

Safety measures shall be taken according to the Laws of Thailand and PTT's regulations on the use of radioactive sources.

NDT inspection for all weld joints, CONTRACTOR shall test as following method.

Shop Welds Inspection

- Visual Inspection 100% for all welding joints
- Penetrant Test at Root Path 100% for all welding joints
- Percent of Radiographic testing 20% of welding joints
- Perform hydro static test

Field Welds Inspection

- Visual Inspection 100% for all welding joints
- Penetrant Test at Root Path 100% for all welding joints
- Percent of Ultrasonic phase array testing (UT phase array) 20% for every piping class that can perform hydro test



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

- Percent of Ultrasonic phase array testing (UT phase array) 100% for all tie-in points of every piping class

- Percent of Ultrasonic phase array testing (UT phase array) 100% for all fillet weld of every piping class. For fillet weld that cannot perform UT phase array, CONTRACTOR can perform Penetrant Test instead.

Ultrasonic and visual examination of welds shall be carried out as a routine check on the quality of WORK in accordance with CONTRACTOR's Standards approved by PTT.

PTT reserves the right to specify the location of spot UT phase array checks.

Welds proven faulty shall be immediately replaced or repaired by CONTRACTOR on his account. All radiographs shall be to CONTRACTOR's account.

In the event that the NDT result is “ Reject ”, it is the CONTRACTOR's responsibility to correct the welding work and increase the inspection percentage according to ASME Section IX standards until the result is “Accept”.

CONTRACTOR shall investigate the extent of the defects by additional spot checks at his own expense until it is proven to the satisfaction of PTT that the rest of the WORK is acceptable.

The reasons for such unsatisfactory welding shall be investigated and welders who can no longer comply with the requirements, shall be



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

withdrawn for training and re-testing. Welder's CERTIFICATE shall no longer be considered valid in such a case.

PTT, at his discretion, may request additional radiographic spot checks on piping, tanks and/or manufacturer's equipment. The cost for these additional radiographs shall be for PTT's account unless unacceptable faults are detected, in which case CONTRACTOR shall bear all the cost.

7.3.3 Field Inspection of Mechanical Equipment

All requirements as specified in Engineering Standards or CONTRACTOR standards approved by PTT shall be adhered to including internal inspection of columns, vessels, heat exchangers, etc:

Although all columns, vessels, etc., shall be ordered with "full works inspection", all such equipment shall be given a visual check upon arrival at SITE and prior to final boxing up, be internally inspected in the presence of PTT's REPRESENTATIVE to ensure cleanliness, correct assembly of internals, etc.

Following installation and prior to MECHANICAL COMPLETION, all heat exchangers shall be leak tested using dry air or nitrogen.

7.3.3.1 Inspection of valves

Before installation, all safety/relief valves shall be shop tested for proper set pressure and tightness according to the API standard. Tests and checking are to be witnessed by PTT's REPRESENTATIVE. Timing of tests and final installation shall be agreed with PTT.

All valves used for online equipment isolation (including control and relief valves), shall be HP leak tested at SITE.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

7.3.3.2 Inspection of air coolers/condensers

CONTRACTOR shall inspect all bearings of fans and drives for cleanliness and proper lubrication, to the satisfaction of PTT. CONTRACTOR shall check rotational direction of motors before coupling up and shall install proper screens or protection guards before operating any rotating equipment.

CONTRACTOR shall pressure test assembled sections in accordance with the relevant code. Individual noise tests shall be carried out to check manufacturer's guarantee.

7.3.3.3 Inspection of rotating equipment

All rotating equipment and drive units received at SITE shall be adequately maintained during the stages of storage and erection, to avoid damage and corrosion.

VENDORS' maintenance instructions shall be obtained and applied.

Rotating equipment with full works inspection and testing shall be visually checked for cleanliness but shall normally not be opened, unless there is clear evidence that an internal inspection is necessary. Gear and screw pumps however shall always be inspected for foreign matter after installing construction spades and prior to system flushing.

7.3.3.4 Piping

Heat treatment of welds shall be carried out where



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

MR. TEERAYUT NIMNUY

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

required by, and in accordance with the PROJECT SPECIFICATION.

Alignment of piping shall be in accordance with ANSI B

31.3. On valve spindles and bolts appropriate grease compounds shall be applied.

7.3.4 Test Certificates of Aggregates for Concrete and Refractory Materials

Prior to concreting, CONTRACTOR shall have available for audit by PTT, test certificates of cement, fine and coarse aggregates, reinforcing steel and of preliminary cube tests. CONTRACTOR shall make further cube and slump tests throughout the civil construction period.

7.3.5 Field Inspection of Electrical Equipment

All requirements as specified in the PTT's Engineering Standards and CONTRACTOR's standards approved by PTT shall be adhered to.

7.3.6 Instrument Installation Procedures

All requirements as specified in the Engineering Standards and CONTRACTOR's standards approved by PTT shall be adhered to.

7.3.7 Specialist Supervision

CONTRACTOR shall arrange VENDOR's specialists to supervise installation and commissioning and to advice during testing, start up and running in of equipment including but not necessarily limited to the following:

- Compressors
- MV Motor and Liquid Rheostat
- Dry Gas Sealed
- Lube Oil System



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems

☒
Quality

☐
Safety

☐
Health

☐
Environment

☐
Lab

☒
Energy

- Instrumentation such as Unit Control Panel (UCP), DCS, Safety PLC, Anti surge control

- Ozone Generator Package

In addition, VENDOR's specialists shall be present during final adjustment and initial operation of equipment, if such is a condition of sale in respect of the VENDOR's guarantee, CONTRACTOR shall ensure that all actions are taken to maintain VENDOR's guarantees.

7.3.8 Lifting and Cranes

CONTRACTOR shall follow PTT work permit procedure for lifting work.

CONTRACTOR shall give a detailed explanation for all lifting work to describe the method and procedure to PTT for approval.

All cranes, lifting appliances and lifting gear must be properly tested, examined and/or inspected before being used on SITE.

All cranes, lifting appliances and lifting gear must conform to the regulations laid down in applicable governmental and local regulations.

CONTRACTOR shall submit full details and rigging studies to PTT of all lifts over live plant and any lift involving cranes in tandem which they propose to carry out. The details are to be submitted in sufficient time to allow PTT to review should he wish to do so.

Comments and/or approval by PTT shall not relieve CONTRACTOR of any of his responsibility for the lifts.

7.4 **Construction SHE Administration**7.4.1 General

Construction work is partly within a working gas separation complex



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

controlled by PTT and partly within the complex controlled by CONTRACTOR. It is important therefore that proper procedure be followed and planning is undertaken to ensure safe working.

PTT's General Conditions for Contractors with Safety Regulations and Regulations for Work Accident, Injuries, Near Misses which are in force in gas separation complex. These shall be strictly adhered to when working within SITE and within 15 meters of an existing pipe track or pipe rack

It is a general requirement with regard to safety, security, cleanliness, compliance with laws and regulations and workmen employment that the conditions be applied throughout the SITE.

PTT's forms for Permits for Construction Work, with Safety Certificate Check List, and Excavation Permit, presently in use within SITE and within 15 meters of an existing pipe track or pipe rack.

At least two months before the start of any WORK at SITE, CONSULTANT, CONTRACTOR and PTT's personnel shall meet to discuss and agree on construction plan, WORK schedule, use of common FACILITIES, coordination with local authorities, permit system, safety and security measures, in accordance with PROJECT EXECUTION PROPOSAL. APPROVED construction plan shall be filed complete with WORK schedule at least a month before WORK starts so that necessary preparations can be made.

CONTRACTOR shall provide a detailed explanation of the construction policy and safety procedures that he proposes to employ on this CONTRACT in accordance with PROJECT EXECUTION PROPOSAL. CONTRACTOR's safety policy and procedures shall include but not be



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

limited to the details of safety practices that are described in the Labour Law of Thailand, covering the rules governing welfare, health, sanitation and safety of employees.

CONTRACTOR shall include in all his SUBCONTRACT conditions a copy of CONTRACTOR's safety policy and procedures in Thai and SUBCONTRACTOR shall be required to sign a copy of the document to confirm that he has read and accepts the policy and procedure.

CONTRACTOR shall indicate on his organization chart within the construction coordination procedure the persons of his field staff who will be responsible for ensuring that safety practices described in the Labour Laws of Thailand are being observed by CONTRACTOR and SUBCONTRACTOR's personnel.

At least one month before any WORK starts, CONTRACTOR shall appoint the following essential personnel and obtain PROJECT ENGINEER APPROVAL. Except for a) and b) subjected to project SHE ENGINEER APPROVAL.

- a) The SHE Manager for at SITE WORK
- b) The SHE Supervisors, Officers and Environmental Specialists
- c) The Civil Engineer(s)
- d) The Mechanical Engineer(s)
- e) The Instrument Engineer(s)
- f) The Electrical Engineer(s)

These persons shall have adequate knowledge and experience of construction trades and shall inspect and be authorised to certify soundness and worthiness of equipment and work methods in their fields of specialty.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

They shall act as bearers of permits and ensure enforcement of specified conditions as may be imposed by PTT

To ensure safety and that each party fully understands their SCOPE OF WORK, a safety meeting shall be held weekly. This shall be attended by safety officers from PTT, CONSULTANT, CONTRACTOR and SUBCONTRACTORS supervisors and shall include a review of the weekly safety record.

During Turnaround work, a safety meeting shall be held on daily basis to ensure safety and that each party fully understands their SCOPE OF WORK and any safety concerned. This shall be attended by safety officers from PTT, CONSULTANT, CONTRACTOR and SUBCONTRACTORS supervisors and shall include a review of the daily safety record.

All WORK equipment shall be inspected by the use of appropriate approved checklists and must be certified weekly and copies must be deposited with the safety officer from CONSULTANT. WORK methods shall be reviewed by safety and discipline engineers before WORK commencement. High risk WORK shall be discussed and APPROVED also by the safety officer and the corresponding discipline engineers from PTT or CONSULTANT as relevant. High risk WORK is defined as WORK involving heavy lifts or WORK at great heights, where damage, injury or fire possibility is distinctly higher than other WORK.

7.4.2 Safety Clothing

Full details shall be given of the safety clothing and safety equipment that CONTRACTOR proposes to use. In particular:

a) CONTRACTOR shall provide safety helmets, safety shoes overalls



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

(long sleeve), gloves, hearing protection, etc. to everybody in construction and fabrication areas.

b) Appropriate eye protection shall be provided and used for all welding, grinding and abrading activities.

Noncompliance with safety regulations shall be considered as misconduct for which CONSULTANT will have the right to require CONTRACTOR to remove offending personnel from SITE.

7.4.3 Safe Working

CONTRACTOR is responsible for his personnel being protected against unsafe working conditions on elevated platforms, etc., by proper scaffolding, safety rails and/or safety harness.

On the request of PTT, any unsafe operation/practice by CONTRACTOR or his SUBCONTRACTORS shall be stopped immediately, and rectified at CONTRACTOR's cost, to the satisfaction of PTT.

Motor vehicles are not allowed in on SITE unless specifically authorised by PTT. Where used for personnel transportation such vehicles shall be designed for such use.

CONTRACTOR shall provide and maintain adequate protection measures such as warning lights and signs, barricades and other necessary precautions for the protection and safety of the public and the workers on the SITE. As a minimum these shall comply with local laws and regulations.

Any injury sustained on PTT's property by any of CONTRACTOR's or his SUBCONTRACTORS personnel shall be immediately reported to PTT.

CONTRACTOR and not PTT shall provide care for injured personnel.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

7.4.4 Contractor Safety Policy & Procedure Implementation.

CONTRACTOR shall describe how he intends to implement his safety policy and procedures and comply with the requirements, addressing not least the following:

- a) Proposed SITE safety staff organization and responsibilities.
- b) Methods of ensuring SUBCONTRACTORS compliance with safety policy and procedures.
- c) Communication with field supervision and labour.
- d) SITE safety education and promotion.
- e) Policy on SUBCONTRACTOR supervision or labour "safe working incentives".
- f) Safety discipline on SUBCONTRACTORS and labour.
- g) Work permit application and administration.

7.4.5 Safety Induction

All CONTRACTOR and SUBCONTRACTOR management, staff, supervision and labour shall attend a "Safety Induction Course" arranged by PTT prior to commencing employment at SITE. Only workers that have to WORK in lived area must obtain GSP's safety induction prior commencing work.

CONTRACTOR shall also arrange for the necessary induction course to all employees, visitors and SUBCONTRACTOR detail on CONTRACTOR's safety policy and procedures, plus safe working practices, disciplines to be employed and SITE security measures allied to safety. Regular refresher courses shall be held, particularly when the job scope of a worker is



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

changed. Accurate personnel attendance records shall be maintained by CONTRACTOR. These courses are to CONTRACTOR's account.

7.4.6 Field Supervision

CONTRACTOR shall describe how labour supervision will be managed and made accountable for promoting safe working practices when controlling their labour.

7.4.7 Construction

CONTRACTOR shall describe both his and SUBCONTRACTORS control over the following field activities within gas separation complex and areas provided by PTT, including but not necessarily limited to the following:

- a) SITE Traffic
- b) Housekeeping
- c) Construction equipment & tools regular inspection & safety marking
- d) Safety clothing enforcement
- e) Emergency response procedures
- f) Scaffolding erection, inspection and maintenance
- g) Temporary electrics safety
- h) SITE smoking and fire prevention
- i) SITE hygiene in toilets and canteen areas
- j) SITE employee first aid and medical welfare
- k) TEMPORARY FACILITIES security monitoring

7.4.8 Permits to WORK

No WORK on PTT's cable trenches, underground FACILITIES and all works within gas separation complex fence shall be started without a permit issued by PTT. A relevant discipline or safety engineer from



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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CONTRACTOR shall apply for a permit outlining the WORK to be conducted, the tools involved and a brief WORK description using the applicable permit forms. Tools, equipment and WORK methodology must be discussed and APPROVED by corresponding PTT's discipline engineers prior to the permit being issued by authorized signatories.

Hot WORK outside SITE fence but at a distance less than 15 metres from an existing pipe track or pipe rack shall not be started without a permit issued by PTT. A relevant discipline or safety engineer of CONTRACTOR shall apply for a permit listing the WORK to be conducted, the tools involved, and a brief WORK description on the applicable forms. An Engineer shall be appointed by PTT and/or PTT to coordinate with PTT's discipline engineers and authorized signatories for WORK permit as necessary. PTT's discipline engineers will reserve the right to inspect equipment and examine WORK methodology at their discretion.

Permit conditions must be strictly adhered to. WORK permits can be withdrawn anytime if conditions stipulated are not adhered to.

CONTRACTOR shall ensure a sufficient supply of safety equipment such as fire extinguishers, fireproof blankets, flameproof temporary electrical equipment, construction equipment flame arrestors, etc. to be able to comply with any WORK permit precautionary requirements made by PTT.

Where WORK conditions deviate from those specified or intended, or when the danger signal or fire siren sounds or a clearly unsafe condition exists, e.g. a distinct smell of gas etc. all WORKs must be stopped until safe conditions are again assured and permits reissued. In these instances CONTRACTOR may be required to evacuate his personnel and equipment



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

to assembly location area allocated by SITE.

For all WORK outside gas separation complex fence and at least 15 metres away from an existing pipe track or pipe rack no work permit is required from PTT or PTT. In these areas CONTRACTOR shall ensure safety through his own procedures and permits.

Combustible gas monitoring must be performed at construction boundary 2 times a day as a minimum.

7.4.9 Contractor Safety Reports

CONTRACTOR shall report to PTT immediately any injury or near misses to his employees, or SUBCONTRACTOR's employees, or damage to construction equipment or UNIT.

A detailed written report of these incidents shall be presented to PTT within seven days, with proposed measures to avert such incidents in the future.

CONTRACTOR shall maintain a weekly record of safety incidents and lost time associated with his WORK to assess safe working performance and any need to introduce additional safety controls.

7.5 **Appearance of Construction Areas**

7.5.1 Appearance

CONTRACTOR shall keep all construction areas in an orderly condition, keep adequate access to operating plant and on the roads for normal traffic and avoid undue exposure of construction materials to climatic and site conditions.

Where necessary, adequate temporary drainage shall be provided by CONTRACTOR in order to avoid stagnant water or muddy pools.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Hard standings and roads shall be kept in good condition.

Final road repairs and final surface laying shall only be applied after approval of PTT and after having satisfied PTT that the roads shall not be broken up further.

7.5.2 Clearing and Cleaning during Site Preparation and the Construction Period

During site preparation and the construction period of UNIT, the construction area of UNIT shall be fenced with metal sheet.

During site preparation and the construction period, CONTRACTOR shall remove from construction areas regularly, and to the satisfaction of PTT, all waste, scrap, excess material, equipment and tools, subject to the rights of PTT. Excavated soil and permanent waste, such as tins, cans, construction materials etc. shall be gathered and dumped on authorized dumping areas approved by PTT. Any unauthorized dumping shall be corrected by CONTRACTOR at no cost to PTT.

Soil dumping area shall be inside PTT's area, in case that PTT's area is not available, CONTRACTOR shall provide other soil dumping areas outside PTT's area and to be compliance with Thai law, regulation and public concerns.

Unless otherwise PTT's instruction, the concrete/brick scraps shall be dumped outside PTT's area and to be compliance with Thai law, regulation and public concerns.

The foreign materials mixed with the soil such as concrete, brick, etc. shall be segregated from the soil before dumping.

Unless otherwise PTT's instruction, the wastes such as insulation, oil, used filters, catalysts, molecular sieves, absorbents and any other hazardous



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

wastes shall be sent to PTT's approved company and to be compliance with Thai law, regulation and public concerns.

CONTRACTOR shall pay particular attention to the internal cleanliness of all equipment and piping. Pre-fabricated piping, transported to the SITE shall be supported clear of the ground. Adequate measures shall be taken that piping shall be protected from sand ingress. In addition, all flange facings and beveled ends of piping, equipment and vessels shall be greased and shall be protected with either wooded or hard PVC covers during storage and construction.

Rotating equipment shall be protected per VENDORS' recommendations before and after installation, if protective measures for such equipment are not included in the PROJECT SPECIFICATION.

Prior to READY FOR START UP, CONTRACTOR shall ensure the UNIT is clean to PTT's satisfaction. The interior of equipment and large piping shall be visually inspected.

7.5.3 Final Cleaning

CONTRACTOR shall remove from the SITE all temporary construction materials and buildings. CONTRACTOR shall disconnect and remove all temporary wiring, plumbing, etc., and shall dispose of all waste material to locations agreed with PTT leaving the SITE in a clean and orderly condition. All surplus and scrap material is to remain the property of PTT. This applies to erection materials held in CONTRACTOR's stores in Thailand or free issued to SUBCONTRACTORS either on or off the SITE. CONTRACTOR shall prepare a surplus and scrap material handover list during the final stages of the work, and ensure that the surplus and scrap



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network																	
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Quality	Safety	Health	Environment	Lab	Energy												

material is correctly identified to permit an orderly transfer to PTT's control. All expenses related to this handover and material storage in PTT designated area to be at CONTRACTOR's expense.

An authorized representative of CONTRACTOR shall remain at SITE at CONTRACTOR's expense until all cleaning work and surplus material handover to PTT has been carried out to the satisfaction of PTT.

7.5.4 Environmental Protection

In accordance with CONTRACTOR's environmental protection policy and relevant Engineering Standard in the Contract, precautions shall be taken to avoid air/water/soil pollution and noise production during the execution of the WORK with a particular attention to avoiding nuisance to others. CONTRACTOR shall be prepared, through provision of trained workers and adequate materials, to respond to any potential environmental pollution incident or event.

7.6 **Reporting during Construction**

CONTRACTOR shall make available to PTT the documents listed below:

7.6.1 Construction Records

CONTRACTOR shall prepare construction records as described in PROJECT SPECIFICATION.

- Civil & Structural records
- Piping fabrication, Installation and Testing records
- Equipment installation & Testing records
- Electrical installation & Testing records
- Instrument installation & Testing records



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

- Building records / Building services records
- Painting / insulation inspection records

7.6.2 Equipment Test Records

CONTRACTOR shall prepare records of the field tests as described in the Engineering Standards and CONTRACTOR's standards approved by PTT.

7.6.3 Monthly Construction Work Force Report

From the start of the construction work, CONTRACTOR shall furnish to PTT not later than the 7th day of the following month, a monthly work force report covering all Labor, foremen and supervision employed by CONTRACTOR and each of his SUBCONTRACTORS. This report shall be grouped into categories, such as civil, pipe prefabrication, pipe installation, mechanical installation/erection, electrical, instrumentation, insulation, tank erection, painting, clerical staff, draughtsmen, etc.

For each category shall be reported:

- the number of men at the end of the month
- the number of hours worked
- cumulative total number of man-hours worked

7.6.4 As Built DRAWINGS

CONTRACTOR shall keep accurate records of all changes made in the field during construction. DRAWING shall be properly marked up to reflect the actual "as built" situation and be sent to PTT in accordance with the PROJECT SPECIFICATION.

7.6.5 System completion and Turnover

To facilitate the smooth transition from construction to pre-commissioning and commissioning the UNIT shall be divided in to systems. Refer



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

paragraph 9 and in particular to:

- PH-10-32 Systemization Philosophy and Completion
- PH-10-31 Pre-commissioning, Commissioning and Acceptance Requirements

CONTRACTOR to color mark up the P & ID's to show his proposed division of the UNIT into discrete system and submit to PTT for review and comment within 3 months of commencing WORK on SITE.

Construction shall be completed by system and in the order/sequence indicated in the agreed schedule and early enough to ensure the achievement of the planned Pre-Commissioning and Commissioning dates. PTT shall inspect systems when notified by CONTRACTOR that a system is mechanically complete and is ready for inspection PTT/COSULTANT shall generate a punch list identify those items that must be complete prior to MECHANICAL COMPLETION of the system.

CONTRACTOR shall complete punch list items to PTT's satisfaction prior to performing the turnover of a system to the CONTRACTOR's Pre-commissioning / Commissioning Group.

CONTRACTOR shall develop and agree with PTT a progress and status reporting system for System Turnover. This shall include status of Test Packs (hydrotesting and re-instatements), Punch Items, Loop checking, motor test runs etc. This shall be extended to cover all activities up to and including RFSU and PERFORMANCE ACCEPTANCE. This shall be fully documented in the Commissioning Plan.

Mechanical Completion Inspection Flowchart



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems

☒ Quality

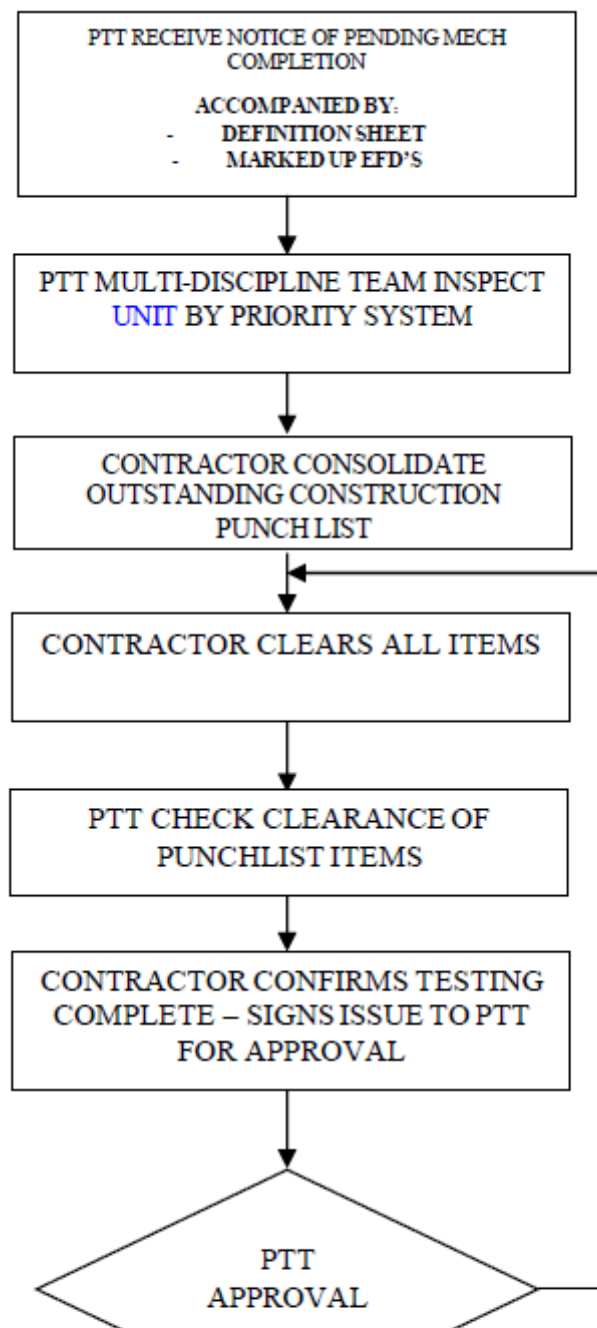
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☐ Health

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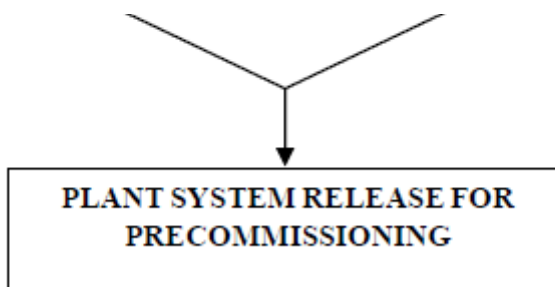
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Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy



8 QUALITY ASSURANCE

8.1 Introduction

This section covers all activities, services related to this CONTRACT through all phases from award or letter of intent including engineering, procurement, construction, pre-commissioning and commissioning through to FINAL ACCEPTANCE of the UNIT in respect of Quality Assurance.

CONTRACTOR shall establish, document and maintain an effective Quality System that satisfies the requirement of ISO 9001: 2000 - Quality management systems –Requirements. It is intended that the CONTRACTOR’s standard Quality Management System be used on this CONTRACT. Where necessary it shall be modified to meet the requirements of PTT and the PROJECT SPECIFICATION.

8.2 Scope

The requirements as stated within this section cover all CONTRACTOR’s activities during the Engineering, Procurement, Construction and Commissioning (EPCC) phases and include the activities of all SUBCONTRACTORS and VENDORS employed by the CONTRACTOR. The requirements of this section shall be issued as an instruction to all SUBCONTRACTORS and VENDORS who shall implement them with their SUB-SUBCONTRACTORS and SUBVENDORS.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

8.3 Definitions

The Quality term definitions contained in ISO 9000 shall apply to this section and have the meaning so stated.

8.4 Reference Documents

ISO 9000 - Quality management systems –Fundamental and vocabulary

ISO 9001 - Quality management systems – Requirements

ISO 9004 - Quality management systems – Guidelines for performance improvements

ISO 10005 - Quality Management – Guidelines for quality plans

ISO 10011-1 - Guidelines for auditing quality systems – Part 1: Auditing

ISO 10011-2 - Guidelines for auditing quality systems – Part 2: Qualification criteria for quality systems auditors

ISO 10011-3 - Guidelines for auditing quality systems – Part 3: Management of audit programs

8.5 Responsibilities

CONTRACTOR shall be responsible for implementing the requirements of this section in executing the PROJECT. CONTRACTOR shall ensure that all SUBCONTRACTORS including VENDORS implement the requirements of this section in their execution of the WORK and in controlling their sub-SUBCONTRACTORS and SUBVENDORS. CONTRACTOR shall be responsible for monitoring that all SUBCONTRACTORS and VENDORS implement this section during the execution of the PROJECT.

8.6 Requirements

8.6.1 Quality Management System

CONTRACTOR shall operate a Quality Management System that complies with the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems

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Quality	Safety	Health	Environment	Lab	Energy

requirements of the International Standard ISO 9001 (Quality management systems -

Requirements) in addition to the requirements of this section during in executing of the Project.

CONTRACTOR shall also ensure that all SUBCONTRACTORS and VENDORS

selected operate a Quality Management System that complies with the requirements of ISO 9001.

CONTRACTOR's Project Quality Plan, as agreed by PTT shall include Quality

Assurance Management objectives, policies and identify the procedures to be

followed and demonstrate compliance with the requirements of ISO 9001.

9 **SAFETY, HEALTH AND ENVIRONMENT REQUIREMENTS**

This section is intended to help CONTRACTOR fulfill his responsibilities for safe working and the protection of the environment. The information in this section is indicative of the level of care that PTT expects CONTRACTOR to incorporate into the Safety, Health and Environment (SHE) Management Plan, Procedures and its Programs for the project. This section shall be implemented in association with EIA and related regulatory requirements.

Operational safety management shall comply with gas separation plant safety regulations.

CONTRACTOR shall take every step possible to ensure the UNIT to be designed, built and tested in



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network																				
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Quality	Safety	Health	Environment	Lab	Energy															

accordance with all SHE related applicable government and local laws, regulations, standards and guidelines.

From all guidelines and standards, the most stringent should be applied.

CONTRACTOR shall enforce the safety, health and environmental requirements in the CONTRACT.

CONTRACTOR shall provide and maintain SHE Management system that have been approved by PTT's Authorized Representative and is in compliance with Thailand's Laws, PTT specifications and EIA requirements. CONTRACTOR is responsible to PTT for the implementation and enforcement of the SHE Plans.

The Safety, Health and Environment (SHE) requirements illustrated below are the minimum requirements that PTT absolutely expect CONTRACTOR and SUBCONTRACTOR to fulfill their performance entire the project.

Some PTT documents or engineering standards have been referred below. In these PTT documents or standards, some Thai Legislations or Regulation numbers have been given as examples. CONTRACTOR shall identify in his SHE plans or procedures all the Thai Legislations or Regulations he need to comply with in order to execute this project, and ensure to use the latest releases and data of these legislations or regulations. The latest one will supersede.

CONTRACTOR shall attend a training on the safety and environmental regulations of the GSP to be able to work in the gas separation plant area In which the safety part will be trained on Monday, Wednesday, Friday at 8.30 am. The validity of the license card will not exceed 6 months per 1 training session. The contractor must notify the name list to the PTT Supervisor at least 7 days in advance.

9.1 Project SHE Plan Requirements

9.1.1 SHE Plans

CONTRACTOR shall issue Project SHE Management Plans to PTT for approval within one month following AWARD OF CONTRACT. These plans shall include but not limited to:

- Design Safety Plan



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Quality	Safety	Health	Environment	Lab	Energy

- Environmental Plan (covering management and Monitoring)
- Worksite SHE Plan
- Waste Management Plan

The Plans shall detail the implementation of all SHE aspects and shall be in accordance with Thai Legislation, the project ITB specifications and PTT Corporate Specifications as the following:

- PTT Corporate SHE Management Expectation No. 0504.05-PH-90-02: PTT Corporate SHE Pre-Qualification Expectations.
- PTT Corporate Health, Safety and Security Requirement No. 0504.05-PH-90.01: PTT Corporate Worksite Health Safety & Security
- PTT Corporate Worksite Environmental Requirements No. 0504.05-PH-91.01: PTT Corporate Worksite Health Safety & Security
- Health & Safety Management Plan No. 0504.05-PR-90.02: PTT Safety and Health Management Plan.
- Environmental Management Plan No. 0504.05-PR-91.01 (typical): PTT Environmental Management Plan.
- SHE Instructions for CONTRACTORS No. PR-90-0504.05-8560-001 (Appendix G)

The CONTRACTOR's Environmental Plan shall take account of mitigation measures during Construction required in the EIA report and the existing PTT Gas Separation Plant being ISO 14001 approved with respect to its Environmental Management System.

9.1.2 SHE Resources

CONTRACTOR shall provide a qualified full-time SHE Manager, an Environmental Specialist, and sufficient Safety Officer(s) as specified in



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Quality	Safety	Health	Environment	Lab	Energy

0504.05-PH-90-01 and 0504.05-PH-91-01, exclusively dedicated to safety, health and environment matters, during the entire Work. CONTRACTOR shall nominate a competent and experienced Design Safety Engineer to coordinate and monitoring the required design SHE activities.

CONTRACTOR shall submit all CVs of such manager, specialist and officer(s) to PTT for approval at least 30 days prior commencing the works. The manager, officer and specialist shall provide advice and direction to CONTRACTOR's employees. The manager, officer and specialist will report to the most senior person on Site.

The number of safety officers technical level within a radius of 50 meters that have operational openings must have at least 1 technical safety officer. In case of working in blind spots, there must have additional safety officers technical level.

CONTRACTOR shall provide a certified safety officer from an authorized institution as required by law. To supervise employees to comply with rules, regulations, orders or measures related to safety and working environment. according to the following criteria

- In the event that there are more than 50 employees working, at least 1 Safety Officer Professional Level shall be provided.
- In the event that there are no more than 50 employees working, at least 1 Safety Officer Supervisory Level shall be provided.

9.1.3 Monthly Report

A monthly report shall be issued by the CONTRACTOR no later that the 7th day of each month. It shall cover all SHE issues and its performance including reporting on progress, reviews, action close out, areas of concern



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Quality	Safety	Health	Environment	Lab	Energy

and incidents, mitigation measure implementation and monitoring records required in the EIA report. The CONTRACTORS performance shall be assessed against Project SHE Key Performance Indicators (KPI's)

9.2 Design SHE

9.2.1 General

CONTRACTOR shall be responsible for ensuring that the FACILITIES designed by himself and SUBCONTRACTORS, comply with the approved standards codes and specifications and are engineered in accordance with the concepts and design principles intended by the process designers, and shall take every step to make certain that it understands these concepts and principles. If there is any area of doubt about what is intended, CONTRACTOR shall raise the matter with PTT.

CONTRACTOR shall notify PTT of any aspect of the process design, which it considers unsafe. CONTRACTOR shall be responsible for ensuring that all the systems within his scope are safe and are constructed, commissioned and ready for INITIAL ACCEPTANCE in accordance with PTT documents and DRAWINGS provided.

CONTRACTOR shall be responsible for ensuring that all PTT's comments made on DRAWINGS, documents and during the SHE reviews are incorporated and are in accordance with the PROJECT SPECIFICATION and all applicable government and local authority regulations. Any modifications required, because of the SHE reviews shall be carried out immediately by CONTRACTOR and shall not constitute a CHANGE IN THE WORK.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

PTT requires the UNIT and all systems forming part of it is engineered, constructed, commissioned with safety, health and environment as a prime consideration. The safety of all personnel, whether constructors, operators, maintenance workers or others, shall be considered at all stages of the design, and action shall be taken to ensure the safety of all personnel during construction, commissioning, operation and maintenance of the UNIT. The UNIT shall be engineered to minimize any damage or loss, which might occur following a loss of containment, or any other operating upset.

A project Design Safety Plan shall be submitted within one month after the CONTRACT awarded. All comments from PTT, if any, shall be incorporated in and the Design Safety Plan shall be re-issued.

9.2.2 Health, Safety and Security Specification

CONTRACTOR shall comply with the Safety, Health and Security Management and Engineering Specification - Document No: 0504.05-PH-90-01: PTT Corporate Worksite Health Safety & Security, 0504.05-ES-90.06: Health Safety and Security Specification and 0504.05ES-91.04: HSE Legislation. The Specification includes (but is not limited to):

- Philosophy and specification of the various Fire & Gas, Shutdown and Safety Systems
- Personnel Protection
- Ergonomics
- Noise levels
- Security

The following SHE Design Safety Reviews as a minimum shall be carried



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

out by CONTRACTOR:

- HAZOP (Hazard and Operability) Studies

To scope of CONTRACTOR to provide HAZOP chairman with certificate.

- Safety Integrity Level (SIL) Assessment Review

To scope of CONTRACTOR to provide SIL chairman with certificate.

- Plot Plan Review
- Constructability Review
- Fire Protection Review
- 1/3 and 2/3rd 3D Model Review
- Hazardous Area Classification Review
- Final Design Safety Review
- Pre-Start up Safety Review

9.2.2.1 Preliminary Safety Reviews conducted at FEED stage

A number of preliminary safety reviews, e.g. Preliminary Plot Plan Review, Preliminary Constructability Review, Preliminary Hazardous Area Classification Review and Preliminary HAZOP Review, were conducted by PTT at the FEED stage. Some actions raised from these reviews have been closed out by PTT. CONTRACTOR shall close out all the outstanding actions satisfactorily during detailed engineering design. CONTRACTOR shall update and re-issue these preliminary safety review reports with information of actions closeout before start of the relevant detailed design safety reviews at EPC stage.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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9.2.2.2 Design Safety Reviews to be conducted by

CONTRACTOR

The CONTRACTOR shall submit to PTT for approval the Engineering Standards / procedures for carrying out each type of the safety reviews. Reference shall be made to the guidance on Hazard Identification and Risk Assessments contained in the Health, Safety and Security Specification - Document No: 0504.05ES-90.06. All comments from PTT, if any, shall be incorporated and the procedures shall be re-issued before the start of safety review meetings.

CONTRACTOR shall identify the timing of each Design Review on his Level 2 and Level 3 Schedules and organize the review meetings. In addition

CONTRACTOR shall advise PTT of exact dates for each review at least one-month (two-months in the case of HAZOP Studies) prior to them taking place. This is to allow PTT to arrange for personnel to participate in the reviews.

CONTRACTOR shall prepare / submit all the required input documents (including the documents and DRAWINGS from VENDORS) at least two weeks before the review meetings. These documents must be formally checked/approved/signed by CONTRACTOR's

Authorized Engineers, and reviewed or approved by PTT where is applicable.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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CONTRACTOR shall maintain an action register for all reviews.

CONTRACTOR shall issue the Design Review Report within two weeks after review meeting, and reissue all Design Review Reports every 2 months until all actions are closed out. The actions closeout shall be recorded properly and must be auditable (with the necessary specific information of action taken e.g. giving equipment/pipeline tag numbers, P&ID or document and Rev numbers etc).

CONTRACTOR shall prepare a Design Review Status Report. The Report shall be issued no later than the 7th day of each month and include the following: -

- Planned date of review
- Actual date of review
- Number of actions raised at each review
- Number of actions closed per review
- Number of actions over due per review

A HAZOP study of the project shall be organized and performed by CONTRACTOR as part of CONTRACTOR's design effort when the P&IDs have reached the required stage of development during EPC detail engineering design. CONTRACTOR shall propose the HAZOP team for approval by PTT. Provision shall be made for attendance by CONTRACTOR, PTT, and PTT



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

operations, etc. The findings of this full HAZOP study shall be incorporated into Contractor's final designs. All P&IDs produced by CONTRACTOR will be submitted for HAZOP Study.

SIL Assessment review should normally take place after the HAZOP Studies review. CONTRACTOR shall ensure to close out the HAZOP actions which may affect the SIL review, and incorporate the HAZOP actions into the input documents required for SIL review. All the Safety Instrumented Functions and the alarms which are not followed by a trip action shall be assessed.

CONTRACTOR shall comply with IEC 61508 and 61511, SIL Review Procedure (Appendix H) and SIL Implementation Procedure (Appendix I) for the design, SIL assessment and implementation of the safety instrumented systems.

CONTRACTOR shall provide the 3RD party independent Chairman for HAZOP Studies and SIL Assessment Reviews.

For 1/3rd model review, the model minimum content shall be, not limited to:

- All large bore piping 6" and above
- All Major equipment with pulling zones
- Maintenance Access, Operation aisles
- Major cable trays, Major control panel location and



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Quality	Safety	Health	Environment	Lab	Energy

Major Field Junction Boxes

- In-line instruments on modelled lines
- Main structure Framing, Bracing
- Monorails, Runway beams
- Main stairs
- Main Floor Penetrations

For 2/3rd model review, the model minimum content shall be, not limited to:

- Pipelines 3" diameter and above
- 50% of pipelines 2" diameter
- All sloping lines
- All lines defined as stress critical
- All equipment
- Major cable trays
- Local Panels / Junction boxes
- In-line instruments on modeled lines
- Instrument control panel
- Primary and secondary steel, platforms, and majority of hand railing
- Utility station, Safety shower and eyebath, and emergency escape routes.

Fire fighting systems shall be based on agreed fire and gas system standards and Government legislations and results of Fire Risk Assessment.

Constructability reviews shall be conducted to identify the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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construction hazards, manage the construction sequence, establish construction strategies, and minimize the construction risks from the design stage. If any hot tapping will be designed for this project, a hot tapping design risk assessment shall be carried out at the engineering design stage and a specific hot tapping procedure shall be produced for each hot tap.

9.2.3 Environmental Specifications

CONTRACTOR shall comply with the Thai Environmental Regulations, Environmental Management and Engineering Specification Document No: 0504.05-PH-91-01: PTT Corporate Worksite Environmental Requirements, 0504.05-ES-91.03: Health Safety and Security Specification and 0504.05-ES-91.04: HSE Legislation. and the EIA. In addition the CONTRACTOR shall provide input into the Environmental Impact Assessment as required by PTT.

9.2.4 Protective Measures for Operational Safety.

The CONTRACTOR shall provide information and input as required into PTT's Report on Protective Measures for Operational Safety as required by Notification of the Ministry of Industry No: 3 (BE 2542) issued under the Factory Act BE 2535. The information shall be supplied based on the safety reviews, hazard and risk assessment carried out by the CONTRACTOR.

9.2.5 Hazardous Materials

During the design the CONTRACTOR shall attempt to reduce the use and production of hazardous material as much as possible.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

One (1) month before commencement of Construction, CONTRACTOR shall produce a hazardous chemicals and dangerous goods/materials inventory. This document shall identify types and quantity of chemicals and hazardous materials during construction, commissioning, initial acceptance and operations and methods that CONTRACTOR shall use to manage, storage, clean-up, recycle and disposal of chemical and hazardous wastes.

Material Safety Data Sheets (MSDS) shall be available for all chemicals, lube oils, fuels, catalysts, and other hazardous substances on the project FACILITIES within CONTRACTOR's scope including VENDOR packages. MSDS shall include full physical and chemical data on the substance; Average composition, in the case of a mixture; Toxicological i.e. Physiological effects; Flammability data; Internationally recognized exposure limits for the substance; Precautions to be taken when storing and handling the substance; First aid and medical treatment to be undertaken in an emergency and, acceptable waste disposal options. These sheets shall be prepared and issued before the HAZOP reviews take place.

The information contained in these Material Safety Data Sheets must be taken fully into account in all design decisions that are made by the CONTRACTOR or any SUPPLIERS, or SUBCONTRACTORS working under his direction.

CONTRACTOR shall ensure that asbestos or products containing asbestos, and Chlorofluorocarbons (CFCs) or other ozone depleting substances and HALON shall not be used on this Project.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

9.2.6 Authorized Engineers

CONTRACTOR shall appoint Authorized Engineers to approve design documents. Authorized Engineers may be appointed only from those employees with a minimum of one year's service with CONTRACTOR and who have the following qualifications, or their national equivalents:

- Senior Engineer status or above
- Chartered Engineer, Registered Professional Engineer

Authorized Engineers shall be appointed in each engineering discipline, and a list of those appointed with their qualifications shall be provided to PTT within six weeks of AWARD OF CONTRACT.

Where required by Thai law, engineering design shall be executed or reviewed and approved by an appropriate Thai Registered Engineer.

9.2.7 Records

CONTRACTOR shall maintain a set of Design Health, Safety and Environment records, which shall form a permanent record of all Design SHE work carried out on the project. The records shall be kept in accordance with Project Documentation Standard. The Design Safety set of records shall be available for inspection and audit by PTT at any time during the life of the project and for three years after the startup of the STATION. If special software used, CONTRACTOR shall maintain, update and hand over all the records including the native e-files.

9.3 **Environmental Compliance**

9.3.1 Environmental Requirements

The Environmental Impact Assessment (EIA) report is a Project



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network																	
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division													
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Quality	Safety	Health	Environment	Lab	Energy												

CONTRACT document. EIA report identifies safety and environmental issues which could impact the design, installation, operation and/or maintenance of the plant CONTRACTOR shall strictly implement all Environmental Mitigation Program as specified in EIA and PROJECT SPECIFICATION PH-91-01: PTT Corporate Worksite Environmental Requirements, ES-91.03: Health Safety and Security Specification and 0504.05-ES-91.04: HSE Legislation.

One (1) month prior to the start of Construction Work, CONTRACTOR shall submit the relevant Environmental procedures to PTT/CONSULTANT for reviews and approval.

9.3.2 Environmental Documents

CONTRACTORS will not be responsible to prepare for the six monthly monitoring report as specified in EIA for ONEP submission but CONTRACTOR shall however provide all documentation and records as may be required by PTT in the format necessary to support six-monthly Environmental Monitoring Report preparation.

In Detailed Engineering CONTRACTOR shall produce a detailed Waste Inventory showing source, type, flow rates /quantities, composition of all liquid, gas and solid emissions from the UNIT during construction, commissioning, initial acceptance and operations.

One (1) month before commencement date of Construction, CONTRACTOR shall produce a Waste Management Plan. This document shall identify wastes generated from the UNIT during construction, commissioning, initial acceptance and operations and the methods that the CONTRACTOR shall use to manage, recycle and disposal of waste.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Hazardous waste handling must be addressed in this plan as per Thai legislation requirements.

One month before Commencement date of Construction CONTRACTOR shall produce an Environmental Monitoring Plan. This document shall identify the requirement for monitoring air, water, noise and other issues according to Monitoring programs specified in EIA during construction, commissioning, initial acceptance and operations and the methods available to manage them. Results and Records will be submitted to PTT not later than the 7th days of month as specified in Item 9.1.3 Monthly Report.

Two (2) months before commencement date of commissioning, CONTRACTOR shall produce and submit his SHE procedures and SHE Pre-Startup Audit Checklist to PTT for approval.

However, the Contractor shall also WORK under the regulation according to EIA report (see Appendix M). The environmental report document shall be done according to the EIA report and also submit to PTT

9.3.3 Complaints Management System

One (1) month prior to the start of Construction Work, CONTRACTOR shall submit a Complaints Management System to PTT ensuring the system is developed to quality, health, safety and environmental issues and potential problems throughout all WORK activities which shall designate its community affairs representative, state the hiring policy for local personnel and state the plan for immediate resolution of concerns.

CONTRACTOR shall, to the extent that such does not adversely affect the quality, cost, safety or schedule of the Work, maximize local industrial



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Quality	Safety	Health	Environment	Lab	Energy

benefits.

CONTRACTOR shall place a high priority on community relations and be sensitive to land PTTs and other affected parties to the project, ensuring Community Affairs Plan is developed to ascertain quality, health, safety and environmental issues and potential problems throughout all WORK activities.

CONTRACTOR is responsible to action or compensation for damages and problems due to CONTRACTOR's activities. CONTRACTOR shall post a Site and/or pipeline route map on a notice board for public announcement and viewing in both Thai and English Languages.

9.3.4 Worksite SHE - Construction, Commissioning, Ready for Start Up & Initial Acceptance

9.3.4.1 General

PTT regards the establishment and maintenance of sound, effective and continuously applied working rules practices in regard to health, safety and environment throughout the SITE of paramount importance.

CONTRACTOR shall describe how Labor supervision shall be managed and made accountable for promoting health and safe working practices and environmental protection when controlling their Labor.

CONTRACTOR shall describe both his and SUBCONTRACTOR control over the SITE WORK with respect to SHE.

CONTRACTOR'S SHE policy, rules and procedures shall



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

include but not be limited to the details of SHE practices that are described in the Labor Law of Thailand, which prescribes the welfare governing health, sanitation and safety of employees. CONTRACTOR shall include in all his SUBCONTRACTOR CONTRACT conditions a copy of Contractor's SHE policy and procedures in Thai and SUBCONTRACTOR shall be required to sign a copy of the document to confirm that he has read and accepts the policy and procedure.

All CONTRACTOR's WORK equipment shall be inspected by the use of appropriate approved checklists and must be certified weekly and copies must be deposited with the safety officer from PTT. WORK methods shall be reviewed by safety and discipline engineers before WORK commencement. High risk WORK shall be discussed and APPROVED also by the safety officer and the corresponding discipline engineers from PTT as relevant. High risk WORK is defined as WORK involving heavy lifts or WORK at great heights, where damage, injury or fire possibility is distinctly higher than other WORKS.

CONTRACTOR shall issue Worksite SHE Plans and a set of SITE SHE procedures to PTT for approval within one month following AWARD OF CONTRACT. All comments by PTT, if any, shall be incorporated in and the



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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SHE plans and procedures shall be re-issued before start of any SITE activities. The SHE Plans will address the major SITE activities and the requirements of hazards identification and risk management at SITE.

CONTRACTOR's safety policy and procedures shall also comply with any special safety specifications included in this Section and PTT's Corporate Specifications.

Contractor shall follow the safe working guidelines in the SHE Instructions To Contractors No. PR-90-0504.05-8560-001.

Bidder is requested to submit a list of proposed SHE procedures at bidding stage.

9.3.4.2 SITE Induction Course

All CONTRACTOR and SUBCONTRACTOR management, staff, supervision and Labor shall attend a "Safety, Health and Environment Induction Course" organized by PTT prior to commencing employment at SITE. Only workers that have to WORK in lived area must obtain GSP's safety induction prior commencing work. The induction course shall inform on CONTRACTORS SHE policy, rules and procedures, and the safe working practices and disciplines to be employed. SITE security measures allied to safety shall be informed. Regular refresher courses shall be held, particularly when the job scope of a worker is changed. Accurate attendance



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Quality	Safety	Health	Environment	Lab	Energy

records shall be maintained by CONTRACTOR.

CONTRACTOR shall also arrange for the necessary induction course to all employees, visitors and SUBCONTRACTOR detail on CONTRACTOR's safety policy and procedures, plus safe working practices, disciplines to be employed and SITE security measures allied to safety. Regular refresher courses shall be held, particularly when the job scope of a worker is changed. Accurate personnel attendance records shall be maintained by CONTRACTOR. These courses are to CONTRACTOR's account.

At least one (1) month before any WORK commences on SITE, CONTRACTOR shall submit the induction course training materials to PTT for review / approval.

9.3.4.3 SHE Personnel

An SHE Manager shall be appointed for establishing, monitoring and maintaining up-to-date the SHE Management System. The SHE Manager shall be responsible for all SHE activities for all phases of design, construction, commissioning, and for all project centers. The SHE Manager shall be adequately trained and experienced in ISO 14000 which will encompass Total Quality Management (TQM) principles.

CONTRACTOR shall show reporting relationships between the SHE Manager and the CONTRACTOR's



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

Executive Management in the SHE Plan. The responsibility, authority, and interrelationships of personnel who manage, perform and verify WORK affecting Project SHE shall be documented in the SHE Plan.

CONTRACTOR shall indicate on his organization chart for the WORK within a Project Coordination Procedure the persons of his field staff who shall be responsible for ensuring that health, safety and environmental practices described in the Labor Laws of Thailand are being observed by CONTRACTOR and SUBCONTRACTORS' personnel.

At least one (1) month before any WORK commences on SITE, CONTRACTOR shall appoint the essential personnel including SITE SHE Manager and adequate number of Safety Supervisors. CONTRACTOR shall submit their CVs and obtain approval from PTT. These persons shall have adequate competencies in their respective disciplines, shall inspect, and be authorized to certify soundness and worthiness of equipment and WORK methods in their fields of specialty. They shall act as bearers of permits and ensure enforcement of specified conditions as may be imposed by PTT.

CONTRACTOR shall nominate adequate number of Site Safety Officers / Supervisors who must be experienced in



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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Quality	Safety	Health	Environment	Lab	Energy

site safety and have received the required trainings with valid certificates as per Thai Legislations.

9.3.4.4 SHE Meetings

To ensure SHE Management and that each party fully understands the impact their SCOPE OF WORK duties, safety meetings shall be held based on: -

- Daily – tool box meetings,
- Weekly – construction manager, superintendent, supervisor, SHE personnel meetings
- Monthly – management committee meetings.

Meetings shall be attended by representatives from PTT, CONTRACTOR and SUBCONTRACTOR and shall include a review of the SHE performance, incidents, mitigation measure implementation and closed-out records.

9.3.4.5 Protection Measures

CONTRACTOR shall comply with the Personal Protective Equipment (PPE) requirements contained in Project Standard Personnel Protection 0504.05-ES-90.04: Personal Protection. All the PPE shall be manufactured to ANSI/BSI or equivalent standards agreed with PTT. CONTRACTOR shall ensure copies of MSDS for all Hazardous Materials are available on SITE prior to their arrival on SITE and copies shall accompany the goods. A MSDS file shall be kept on SITE. A copy of the MSDS



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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shall be available to all personnel in the area where the hazardous material is being stored or used.

CONTRACTOR shall provide and maintain adequate protection measures such as warning lights and signs, barriers and other necessary precautions for the protection and safety of PTTS personnel, the public and the workers in the area. As a minimum, these shall comply with local laws and regulations and PH-90.01

All WORK equipment shall be inspected by the use of appropriate checklists and shall be certified weekly and copies shall be available to PTT.

The CONTRACTOR shall carry out risk assessment and Job Safety Analysis (JSA) prior to commencing the WORK. These assessments shall also include impacts from the ongoing operation of the Gas Separation Plant and the simultaneous nature of the WORK activities. This shall be particularly done for high risk work, where damage, injury or fire possibility is distinctly higher than other works and may include heavy lifts, WORK at great heights or in close proximity to live plant, high pressure testing, chemical and steam cleaning, confined space entry, hot work, introduction of hydrocarbons during commissioning, ready for start up and initial acceptance testing of UNIT.

CONTRACTOR shall produce a WORK method



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

statement for PTT approval and erect and maintain temporary full height screen, (welding curtain) between existing spheres and new spheres during construction of new spheres.

Lifting over the exiting spheres or pipelines is not permitted. Any WORK within 15 meters of the existing pipelines or equipment must be under control of Permit To Work.

The CONTRACTOR shall prepare hazard and risk assessment, JSA procedures which shall be reviewed by PTT.

CONTRACTOR shall take special precautions as WORK changes from construction through to initial acceptance and take account of the additional risks posed by hydrocarbons being introduced into the plant. This shall include enhanced SITE induction, SHE meetings, permit to WORK system, control of personnel, segregation of areas, emergency response. The CONTRACTOR shall update all relevant procedures and work practices and carry out SHE reviews to reflect the change in working stage. This shall include stages after construction, pre-commissioning and commissioning.

CONTRACTOR shall note that at certain stages the execution of the WORK may take place in areas shared with PTT's personnel and other CONSTRUCTOR



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

/SUBCONTRACTORS. Work shall be performed simultaneously and may result in a high concentration of manpower. During this period particular attention shall be paid to SHE both within the areas of the SITE and at the interface with adjoining areas. In addition CONTRACTOR shall be required to liaison with neighboring workforces at management level, and agree on procedures to regulate the WORK where interaction may take place.

9.3.4.6 Permit to Work System

All WORK by CONTRACTOR shall be controlled through an approved Permit to Work System. Where work is being done off site it shall be to the relevant OTHER PTT's system.

One (1) month before commencement date of Construction CONTRACTOR shall submit work permit system to PTT for reviews and approval, including the site preparation works

In all cases, conditions stipulated in the permit must be strictly adhered to. Permits to Work can be withdrawn anytime if it is so proved that conditions stipulated are not adhered to. CONTRACTOR shall ensure a sufficient supply of safety equipment as required by Permit to Work. In any case where work conditions deviate from those specified or intended, or when the danger signal or



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fire siren sounds or a clearly unsafe condition exists, e.g. a distinct smell of gas leak, etc., all works must be stopped until safe conditions are again assured and permits re issued. In these instances, CONTRACTOR may be required to evacuate his personnel and equipment.

9.3.4.7 Incidents and Emergency Response

One (1) month before the start of the Work on SITE, the CONTRACTOR shall submit its Incident notification and investigation procedure for approval.

CONTRACTOR shall report to PTT immediately on the occurrence of any injury to his employees, or SUBCONTRACTORS employees, incident or damage to equipment or plant, including near misses within 24 h of incidents. A detailed written report of these incidents shall be presented to PTT within 3 days, with proposed measures to avert such incidents. Accident and incident management shall incorporate PTT's/CONSULTANT's Key Performance Indicators (KPIs) requirements.

CONTRACTOR will update in weekly SHE meeting on the status of follow-up actions and will co-operate and provide all requested information to assist investigation and preventive action of any accident or incident.

CONTRACTOR shall incorporate accident/incident records in SHE monthly performance statistics report to PTT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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CONTRACTOR shall maintain a record of all incidents involving WORK to assess SHE working performance and the need to introduce additional controls.

CONTRACTOR shall be responsible for Emergency Response on the SITE and shall prepare an Emergency Response Plan for review one month prior to WORK on SITE. This plan shall detail the CONTRACTORS response in case of an accident or emergency and shall be integrated into the existing PTT Gas Separation PLANT Emergency Response Plan, as required. This document shall be re-appraised in the case of an incident. The Plan shall be tested on a periodic basis.

9.3.4.8 Unsafe Conditions and Acts

Non compliance with PTT's or OTHER PTTS' SHE regulations shall be considered as misconduct for which PTT shall have the right to require CONTRACTOR to remove offending personnel from the SITE. In certain cases, PTT may suspend work that is considered by PTT as unsafe, until compliance with safety regulations has been re-established.

On the request of PTT, any unsafe operation/practice by CONTRACTOR or his SUBCONTRACTORS shall be stopped immediately and rectified at CONTRACTORS or his SUBCONTRACTORS cost to the satisfaction of PTT.

If, during the execution of the WORK, conditions at a



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

particular location within the SITE are deemed unsafe by CONTRACTOR, he shall notify PTT immediately. PTT shall be responsible for ensuring that the SITE is safe before the WORK recommences.

9.3.5 As Built Report

CONTRACTORS shall prepare a Safety, Health and Environmental (SHE) As-Built Report according to OWNER guideline and submit to PTT for review and approval after the Construction Phase and prior to commissioning the overall FACILITIES.

The SHE As-Built Report will include, as a minimum: a description of the project environmental setting, SHE performance, statistics and KPIs monitoring, SHE issues, incidents and aspects of construction by Phase, selected photographs (pre-construction, construction, and post-construction) showing activity, and any permits, approvals and documentation issued during the construction phases.

9.3.6 Security

One (1) month before the start of the Work on SITE, the CONTRACTOR shall submit its Security Plan and a Transportation Management Plan for approval. The Security Plan shall, as a minimum, include control of access to the SITE (including to offices, accommodations and all work and material storage areas); a system of periodic checks of all the SITE; accountability procedures for the requisition and issue of materials and equipment; and a system for prompt reporting of incident loss, theft or



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Division/Department :

Technical and Asset Engineering

Division

Related standard systems

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Quality

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Health

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Environment

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Lab

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Energy

vandalism. A staffing plan shall also be included covering dayshift and night shift with the number of security personnel and their training/competency levels.

9.3.7 Onsite Temporary FACILITIES / Laydown

CONTRACTOR shall provide adequate number of all necessary temporary FACILITIES to his workforce at site as per requirements of Thai legislations, including toilets, rest rooms, first aid FACILITIES, medical services etc.

CONTRACTOR shall responsible for cost of municipal waste disposal.

9.3.8 Office Safety,

CONTRACTOR's SHE plans, procedures, audits, emergency plans and drills and monthly performance reports shall cover the safety of engineering offices. Zero lost time injuries of all personnel who work for this project including employees of PTT, CONTRACTOR, SUBCONTRACTORS, suppliers and VENDORS etc. is the target of this project.

10 **WITNESS TESTING**

CONTRACTOR shall, at the request of the PTT for approval and witness, provide the schedule and program of

work which consists of the following:

10.1 Complete factory acceptance test of UCP of AOP Package

10.2 Complete factory acceptance test of MCC



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

- 10.3 Complete factory acceptance test of DCS, SIS
- 10.4 Complete factory acceptance test of all Pressure Vessels
- 10.5 Complete factory acceptance test of AOP Package
- 10.6 Complete factory acceptance test of Air-Cooled Heat Exchangers
- 10.7 Complete factory acceptance test of MV Cables
- 10.8 Complete local test shop of Control Valves, On-Off Valves, Shut-off Valves, Safety Valves

11 COMMISSIONING REQUIREMENTS

CONTRACTOR is responsible for pre commissioning and commissioning and start-up including performance testing of the UNIT through to INITIAL ACCEPTANCE and shall prepare and submit to PTT for approval the proposed methods and detailed procedures as required of the CONTRACT. The CONTRACTOR shall submit to PTT preliminary commissioning procedures 6 months prior to the start of pre-commissioning. Detailed procedures shall be submitted no later than 3 months prior to the start of pre-commissioning.

Pre-commissioning activities are those carried out from MECHANICAL COMPLETION up to the stage when the UNIT or specified subdivision thereof has achieved READY FOR START-UP.

Commissioning covers all activities from READY FOR START-UP through to INITIAL ACCEPTANCE and includes performance testing.

CONTRACTOR's detailed procedures shall be based on the following that can be found under PH-10-32 Systemization Philosophy and Completion

PH-10-31 Pre-commissioning, Commissioning and Acceptance Requirements

PR-10-31 Cleaning of Lines and Equipment

PR-10-32 Guidelines for Operating Manual Preparation

CONTRACTOR shall follow these PROJECT SPECIFICATIONS and develop the necessary strategy, procedures and manuals to safely pre-commission, commission, start-up and performance test the UNIT.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

CONTRACTOR shall supply all necessary services, utilities, consumables, test and flushing mediums and equipment, test equipment and any other requirements necessary to meet this objective.

12 PERFORMANCE REQUIREMENTS

12.1 Performance Guarantees

CONTRACTOR shall guarantee the performance of the UNIT in accordance with the requirements set out in Attachment 12 of the CONTRACT.

13 **GUARANTEES RELATING TO THE WORK, LIABILITIES, FINAL ACCEPTANCE**

13.1 Guarantees Relating to the WORK

- 13.1.1 CONTRACTOR guarantees that its WORK will be free from defects and that the UNIT will be capable of continuous, safe, reliable and smooth operation, start-up and shutdown.
- 13.1.2 CONTRACTOR guarantees that the WORK including all the WORK performed by SUBCONTRACTORS and VENDORS employed by CONTRACTOR and all documentation, manuals, etc. furnished by CONTRACTOR to PTT will be of first-class quality and in every respect in accordance with this CONTRACT, of good engineering practices and of the latest state of the art, and shall be such as to ensure that the UNIT is in all respects suitable for the purpose intended under this CONTRACT.
- 13.1.3 CONTRACTOR guarantees that all equipment supplied by CONTRACTOR and sized or specified by it shall be entirely adequate to satisfy the operating conditions and performance requirements specified in the CONTRACT.
- 13.1.4 CONTRACTOR guarantees that each item of equipment and materials for the UNIT supplied by CONTRACTOR will be entirely of proven design,



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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modern, brand new and unused, of good quality workmanship, will conform in all aspects to the CONTRACT and will be free from defects and fully suitable for the use intended.

- 13.1.5 CONTRACTOR guarantees that all other items of the WORK performed under this CONTRACT including without limitation construction, erection, pre-commissioning, commissioning, testing, training, supervision and assistance shall be performed with due diligence, will be of good quality workmanship and will be at the highest standards in the industry in every respect.
- 13.1.6 Following PERFORMANCE ACCEPTANCE, CONTRACTOR's guarantees under this Article 13.1 shall not cover either of the following:
- incorrect operation by PTT or
 - operation under more severe conditions than those specified in the PROJECT RECORD, or
 - normal wear and tear, normal corrosion or normal erosion.
- 13.1.7 CONTRACTOR undertakes all guarantees as per this Article 13.1 for a period ending 365 days following the date the PTT's committee has accepted the service successfully in accordance with the conditions set by PTT.
- 13.1.8 Notwithstanding CONTRACTOR's liabilities and obligation stated elsewhere in this CONTRACT, in case of supply by a VENDOR under a purchase order, CONTRACTOR shall require VENDOR to retain full responsibility during the warranty period of Article 13.1.7 for the correctness of the parts and their proper fitting to the machines for which the same are ordered, and shall promptly replace such parts which require



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

replacement under the guarantee free of cost to PTT within the shortest possible time.

13.2 Remedies and Liabilities with Respect to WORK

13.2.1 In the event of a defect or breach of any or all CONTRACTOR's guarantees given under Article 13.1 and such defect or breach having been notified by PTT to CONTRACTOR within 30 (thirty) Days after the expiry of the period as per Article 13.1.7 above, then CONTRACTOR shall immediately and in no event later than 7 (seven) Days of receipt of the said NOTICE and at CONTRACTOR's own expense provide all services and make every effort to investigate the defect or breach of guarantee and propose adequate means of making good or correcting the defect or breach, which shall take into account all possible means of minimizing hardship or damage caused to PTT in consequence of the defect or breach and the making good or correcting such defect or breach. During the investigation CONTRACTOR shall continually keep PTT informed of its findings and shall be available for meetings with PTT to discuss immediate action to be taken.

As soon as possible and in no event later than 7 (seven) Days after notification of the defect or breach by PTT to CONTRACTOR, CONTRACTOR shall make a written proposal to PTT stating all measures CONTRACTOR intends to take and the estimated duration of such measures.

13.2.2 Subject to PTT's approval of proposals made by CONTRACTOR according to Article 13.2.1, CONTRACTOR shall immediately and with



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

due diligence make good or correct all said defects or breach by repair or replacement or addition or alteration of any item of equipment or material for the UNIT and provide corrective engineering services or any other activities or services necessary and required in the respective situation to make good or correct the UNIT to the satisfaction of PTT.

- 13.2.3 Any and all costs and expenses incurred by CONTRACTOR for making good and correcting the defect or breach shall be borne by CONTRACTOR including but not limited to the cost for repair and replacement of items of equipment or material, customs duties. Taxes and port charges, transportation of equipment or material from or to the SITE, dismantling and removal from the SITE and export of any defective item of equipment or material, construction, erection, pre-commissioning, commissioning and any cost or expense for modification, or repetition of design, engineering, etc.
- 13.2.4 Should CONTRACTOR neglect or refuse to supply a proposal under Article 13.2.1 to PTT immediately after the date of notification of the defect or breach by PTT, or should CONTRACTOR fail to start or continue to make good or correct immediately any defect or breach of guarantee under Article 13.1, PTT may take over and correct or make good or arrange for making good or correcting any defect or breach of guarantee itself and the cost thereof shall be borne and paid by CONTRACTOR without any loss of rights by PTT with respect to any guarantees under Article 13.1.
- 13.2.5 In any event, CONTRACTOR total liability shall in no event exceed the CONTRACT PRICE of SCOPE OF WORK on which such liability is



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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Related standard systems					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Quality	Safety	Health	Environment	Lab	Energy

based.

13.3 FINAL ACCEPTANCE

Upon the expiration of all guarantees relating to the WORK and fulfillment of all obligations of CONTRACTOR related thereto, including that CONTRACTOR has made good and corrected all defects of the WORK and /or any breach of guarantee, and provided that the CERTIFICATE of INITIAL ACCEPTANCE and CERTIFICATE of FINAL PAYMENT AND RELEASE has been issued, PTT shall issue to CONTRACTOR the CERTIFICATE of FINAL ACCEPTANCE.

13.3.1 FINAL ACCEPTANCE, CONTRACTOR shall provide to PTT the benefit of all remaining guarantees relating to equipment and materials incorporated into the UNIT (if any).

14 MECHANICAL COMPLETION, PRECOMMISSIONING, READY FOR START-UP, COMMISSIONING, PERFORMANCE TEST RUNS, and PERFORMANCE ACCEPTANCE

14.1 **MECHANICAL COMPLETION, pre-commissioning, start-up, commissioning, and testing** activities for the equipment, UNIT will be carried out according to a detailed procedure and schedule formulated by CONTRACTOR on the basis of the procedures described in Attachment 12 and 13 and issued to PTT at least 1 (one) month before the scheduled date of MECHANICAL COMPLETION of the first UNIT and approved by PTT.

14.2 MECHANICAL COMPLETION

14.2.1 CONTRACTOR shall perform the construction and erection of the UNIT in accordance with the procedures and schedule as per Article 14.1 in order to achieve MECHANICAL COMPLETION.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
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- 14.2.2 MECHANICAL COMPLETION of a UNIT shall be achieved when the UNIT has been completed mechanically and structurally, put in a clean and tidy condition and when the operations and activities specified in Article 14.1 and PROJECT SPECIFICATION have been carried out.
- 14.2.3 CONTRACTOR shall submit to PTT a written NOTICE when it considers that the UNIT or has achieved MECHANICAL COMPLETION as stated in Article 14.2.2
- 14.2.4 PTT shall within 21 (twenty one) Days from the receipt of such written NOTICE perform either of the following:
- 14.2.4.1 issue the CERTIFICATE of MECHANICAL COMPLETION for the UNIT.
- 14.2.4.2 or, if PTT judges that the UNIT has not achieved MECHANICAL COMPLETION, give NOTICE to CONTRACTOR of the deficiencies to be corrected before MECHANICAL COMPLETION is considered to be achieved;
CONTRACTOR shall correct all such deficiencies at its expense, and shall give written NOTICE to PTT after all deficiencies have been corrected. All procedures mentioned in the foregoing Articles for the issue by PTT of the CERTIFICATE of MECHANICAL COMPLETION shall be followed;
- 14.2.4.3 or, if PTT judges that the UNIT has not achieved MECHANICAL COMPLETION entirely and still has minor deficiencies or minor activities to be completed,



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

which do not hinder or impede the operability and safety of the pre-commissioning and/or commissioning of the UNIT, issue the CERTIFICATE of MECHANICAL COMPLETION for the UNIT under the reservation of a list of activities to be completed or the deficiencies to be corrected by CONTRACTOR before INITIAL ACCEPTANCE.

- 14.2.4.4 If PTT does not take any action within 21 (twenty one) Days after receipt of CONTRACTOR's written NOTICE that MECHANICAL COMPLETION has been achieved, MECHANICAL COMPLETION shall be deemed to have been achieved. Notwithstanding that the CERTIFICATE of MECHANICAL COMPLETION has not been approved, CONTRACTOR may proceed with his performance of the remaining WORK to achieve READY FOR START-UP.
- In no event, however, shall any failure of PTT to take any action be considered as an approval of the operations or activities to be carried out by CONTRACTOR, nor as a recognition of the achievement of MECHANICAL COMPLETION for the UNIT, nor shall CONTRACTOR thereby be relieved from any obligations under this CONTRACT with respect to MECHANICAL COMPLETION.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div><div>Quality</div></div>	<div><div></div><div>Safety</div></div>	<div><div></div><div>Health</div></div>	<div><div></div><div>Environment</div></div>	<div><div></div><div>Lab</div></div>	<div><div></div><div>Energy</div></div>

14.2.4.5 Should CONTRACTOR be delayed in the completion of the WORK by any act or neglect of PTT or PTT's REPRESENTATIVE or by Force Majeure, then an extension of time sufficient to compensate for the delay will be granted by PTT. Provided that PTT is not bound to take into account any act or circumstance by which CONTRACTOR claims to have been delayed unless CONTRACTOR has within 7 (seven) Days after such act or a circumstance has arisen submitted to PTT a full and detailed particulars of any extension of time to which he considers himself entitled in order that such submission may be investigated at the time, no claim for extension of time will be considered by PTT unless full and detailed particulars are submitted to PTT before expiry of the time stipulated in the CONTRACT.

14.2.4.6 CONTRACTOR shall not be entitled to claim for expenses or any damage incurred from the delay in the completion of WORK by Force Majeure.

14.3 PRECOMMISSIONING

14.3.1 Pre-commissioning activities of the UNIT shall immediately start at MECHANICAL COMPLETION, CONTRACTOR shall carry out all pre-commissioning activities in accordance with and including those specified in Article 14.1



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

14.4 READY FOR START-UP

- 14.4.1 Upon completion of the pre-commissioning activities of the UNIT as defined in Attachment 12 and 13 the PROJECT SPECIFICATION, CONTRACTOR shall submit to PTT a written NOTICE that it considers the UNIT thereof is READY FOR START-UP.
- 14.4.2 When CONTRACTOR considers the UNIT thereof to be READY FOR START-UP, CONTRACTOR shall so notify PTT and PTT shall within 15 (fifteen) Days from the receipt of CONTRACTOR's written NOTICE perform either of the following:
- 14.4.2.1 issue the CERTIFICATE of READY FOR START-UP for the UNIT;
- 14.4.2.2 or, if PTT judges that the UNIT thereof is not READY FOR START-UP, give NOTICE to CONTRACTOR of the activities to be carried out before READY FOR START-UP is considered to be achieved.
- CONTRACTOR shall carry out all such activities at its expense and shall give written NOTICE to PTT after all such actions have been carried out and all procedures mentioned in the foregoing Article for the issue by PTT of the CERTIFICATE of READY FOR START-UP shall be followed.
- 14.4.3 If PTT does not take action within 7 (seven) Days after receipt of CONTRACTOR's written NOTICE that the UNIT is READY FOR START-UP, and if CONTRACTOR feels that thereby its performance of the remaining WORK will be delayed, CONTRACTOR shall so inform



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
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Quality	Safety	Health	Environment	Lab	Energy

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If PTT still does not take any action within a further 7 (seven) Days period, CONTRACTOR shall proceed with the respective operations and activities for the commissioning of the UNIT.

In no event however, shall any failure of PTT to take any action be considered as an approval that the UNIT is READY FOR START-UP, nor shall CONTRACTOR thereby be relieved from any other obligations under this CONTRACT.

14.5 COMMISSIONING

- 14.5.1 Upon issuance of the CERTIFICATE of READY FOR START-UP for the UNIT, or under the provision of Article 14.4.3., CONTRACTOR shall, in accordance with operating manuals and proper sequence approved by PTT and in accordance with the provisions described in Article 14.1 and under CONTRACTOR's responsibility, carry out the orderly commissioning of the UNIT.
- 14.5.2 Commissioning means to achieve a condition in which UNIT is in a proper, stable, continuous operational condition free from leaks and defects, and to perform the design conditions as specified in attachment 12.
- 14.5.3 After CONTRACTOR has brought UNIT into the condition described in Article 14.5.2 above, CONTRACTOR shall demonstrate by way of a preliminary demonstration in the presence of PTT that the UNIT is ready for demonstration of the PERFORMANCE GUARANTEES and RELIABILITY TESTS.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

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MR. PANUWAT TOHSAKUL

Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

14.5.4 CONTRACTOR shall at any time during commissioning be entitled to give 3 (three) Days prior written NOTICE to PTT stating that in its opinion the UNIT is ready for demonstration of the PERFORMANCE GUARANTEES of Attachment 12. Thereupon it shall be demonstrated by CONTRACTOR, that UNIT performs under stable conditions in Articles 14.5.2 for a period of 1 (one) Day.

14.5.5 Upon successful completion of the preliminary 1-day demonstration, CONTRACTOR shall state in writing that it considers the UNIT as ready for demonstration of the PERFORMANCE GUARANTEES of Attachment 12 and RELIABILITY TEST.

14.6 Performance Test Runs, RELIABILITY TEST and PERFORMANCE ACCEPTANCE

14.6.1 The performance test runs for the UNIT shall relate to the PERFORMANCE GUARANTEES as defined in Attachment 12.

14.6.2 CONTRACTOR shall give PTT 3 (three) Days NOTICE in writing of the planned start of the performance tests. The performance test runs shall start immediately after the UNIT has been accepted by PTT as the completion of preliminary 1-day demonstration and ready for demonstration of the Performance Test Runs in accordance with the PERFORMANCE GUARANTEES in Attachment 12 and 13 (3 Days for the UNIT) and RELIABILITY TEST. The test shall be carried out in accordance with the procedures as per Article 14.1, Attachment 12 and Attachment 13 to verify that the PERFORMANCE GUARANTEES specified in Article 15 and RELIABILITY TEST in Attachment 13 are fulfilled. The methods of



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

measurement and the accuracy thereof shall be according to of Attachment 12, Attachment 13 and Article 14.1 and the cost of any measurement equipment required for the purpose of test runs shall be borne by CONTRACTOR.

- 14.6.3 In case of actual deviations from the design conditions stipulated in the CONTRACT and or in case of interruption of a performance test run, the provisions of Attachment 12 and Article 14.1 shall be applied.
- 14.6.4 Promptly after completion of each Performance Test Runs CONTRACTOR shall submit to PTT in writing a performance test run report showing the results of the Performance Test Runs for PTT to judge whether the PERFORMANCE GUARANTEES are met or not.
- 14.6.5 In the event that as the result of test run report(s), PTT judges that any or all of the PERFORMANCE GUARANTEES as per Article 15 have not been met CONTRACTOR shall promptly make good of the UNIT or, solely at PTT's option, pay liquidated damages: all as stipulated in Attachment 12.
- After each aforesaid making good of the UNIT, additional Performance Test Run(s) shall be carried out according to the provisions of this Article 14.6 until the PERFORMANCE GUARANTEES are met, unless otherwise agreed by PTT.
- 14.6.6 In the event that test run report(s) as per Article 14.6.4 have proven that the PERFORMANCE GUARANTEES as per Article 15 are fulfilled and/or if applicable liquidated damages as per Article 14.6.5 have been paid by CONTRACTOR, PERFORMANCE ACCEPTANCE shall be deemed to have been achieved, when PTT have received the aforesaid liquidated



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

damages; and the RELIABILITY TEST as per Attachment 13 are fulfilled.

Within 15 (fifteen) Days thereafter PTT shall issue the confirmation to CONTRACTOR, in the form of a CERTIFICATE of PERFORMANCE ACCEPTANCE, that the UNIT has passed its performance tests and hence achieved PERFORMANCE ACCEPTANCE.

14.6.7 Achievement of PERFORMANCE ACCEPTANCE shall not relieve CONTRACTOR from any of its other obligations and responsibilities under the CONTRACT.

14.6.8 Achievement of PERFORMANCE ACCEPTANCE for UNIT shall be the date of transfer of care, custody and control of the UNIT and it relevant necessary Systems and accessories from CONTRACTOR to PTT. These necessary Systems and accessories shall not include load sharing system, substation building and any other works that CONTRACTOR need to take care, custody and control until the STATION is achieved the PERFORMANCE ACCEPTANCE.

15 PERFORMANCE GUARANTEES

- 15.1 CONTRACTOR guarantees to PTT to achieve all PERFORMANCE GUARANTEES as are stipulated in Attachment 12.
- 15.2 The PERFORMANCE GUARANTEES shall be proven as described in Article 14.

16 INITIAL ACCEPTANCE

- 16.1 INITIAL ACCEPTANCE shall be occurred upon achievement of PERFORMANCE ACCEPTANCE and completion of WORK, subject to approval of the CERTIFICATE of INITIAL ACCEPTANCE.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
Related standard systems					
<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>
Quality	Safety	Health	Environment	Lab	Energy

- 16.2 When CONTRACTOR considers that INITIAL ACCEPTANCE has been achieved, he shall submit to PTT a written NOTICE stating that PERFORMANCE ACCEPTANCE of all UNITS has been achieved according to Article 14.6.6 and that the WORK has been completed in the form of a CERTIFICATE of INITIAL ACCEPTANCE as contained in Attachment 13 and the PROJECT SPECIFICATION.
- 16.3 PTT shall within 30 (thirty) Days from receipt of such written NOTICE perform either of the following:
- 16.3.1 or, if PTT judges that the UNIT has not achieved INITIAL ACCEPTANCE entirely and still has minor deficiencies or minor activities to be completed, which do not hinder or impede the safe operation of the UNIT, confirm in writing the date of INITIAL ACCEPTANCE to be the date of CONTRACTOR's written NOTICE as per Article 16.3 under the reservation of the activities to be completed and the deficiencies to be corrected before issue of the CERTIFICATE of INITIAL ACCEPTANCE.
- 16.3.2 or, if PTT judges that the UNIT has not achieved INITIAL ACCEPTANCE due to non-achievement of PERFORMANCE ACCEPTANCE as per Article 14.6.6 and / or due to deficiencies in the WORK which hinder or impede safe operation of the UNIT, PTT will give written NOTICE to CONTRACTOR of the deficiencies to be corrected in order to achieve INITIAL ACCEPTANCE and the provisions stipulated under this Article shall be applied again.
- 16.3.3 Achievement of INITIAL ACCEPTANCE shall be the date of transfer of care, custody and control of the UNIT from CONTRACTOR to PTT.
- 16.3.4 Notwithstanding the provisions of this Article 16, in the event that INITIAL ACCEPTANCE is not achieved in 365 (Three hundred and sixty



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

By :

MR. TEERAYUT NIMNUY

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering

Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

five) Days of READY FOR START UP of the UNIT for reasons attributable to PTT, PTT shall issue the CERTIFICATE of INITIAL ACCEPTANCE to CONTRACTOR.

17

ATTACHED DOCUMENT

Attachment No.	Document Name
1	LETTER OF ACTKNOWLEDGEMENT
2	LETTER OF CONFIRMATION ON QUALIFICATIONS TO DO BUSINESS WITH PTT
3	BID FORM
	3.1 FORM OF BID LETTER
	3.2 INFORMATION ON BIDDER 3.2.1 CERTIFICATE OF ELIGIBILITY 3.2.2 FORM OF SECRECY AGREEMENT 3.2.3 FORM OF JOINT VENTURE OR CONSORTIUM 3.2.4 FINANCIAL CAPABILITY 3.2.5 REFERENCE OF BIDDER 3.2.6 FORM FOR CERTIFICATE OF RELATIONSHIP OF PARENT COMPANY 3.2.7 UNDERTAKING FORM THE FINANCIALLY ENTITY OR ITS PARENT COMPANY



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023

Rev.1

SAP PR No.1120018712

Division/Department :

Technical and Asset Engineering
Division

Related standard systems



Quality



Safety



Health



Environment



Lab



Energy

Attachment No.	Document Name
	3.3 LUMP SUM PRICES
	3.4 BREAK DOWN OF BID PRICE
	3.5 UNIT PRICES FOR CHANGES OF WORK
	3.6 PRICED RECOMMENDED SPARE PARTS LIST
	3.7 EXCEPTIONS AND DEVIATIONS
4	TECHNICAL INFORMATION (FEED PACKAGE)
5	SAMPLE FORM OF PERFORMANCE SECURITY
6	EXISTING INFORMATION AND DRAWING
7	SCOPE OF PTT SUPPLY IN COMPRESSOR SKID
8	GSP VENDOR LIST REV.16.1
9	ENGINEERING, PROCURMENT AND CONSTRUCTION CONTRACT
10	PTT ENGINEERING SPECIFICATION
11	TYPICAL INSTALLATION
12	PERFORMANCE GUARANTEES AND LIQUIDATED DAMAGES
13	DEFINITION OF COMPLETION
14	Integrity Pact



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network

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Create date : 07 April 2023
Rev.1
SAP PR No.1120018712

Division/Department :
Technical and Asset Engineering
Division

Related standard systems

☒ Quality ☐ Safety ☐ Health ☐ Environment ☐ Lab ☒ Energy

Attachment No.	Document Name
15	PTT Suppliers Sustainable Code of Conduct
16	คู่มือ หลักการปฏิบัติงานตรวจสอบคุณภาพงานโครงการก่อสร้าง ส่วนวิศวกรรมเทคนิค
17	คู่มือ ความปลอดภัยอาชีวอนามัยและสิ่งแวดล้อม โครงการงานก่อสร้าง ส่วนวิศวกรรมเทคนิค
18	มาตรการ EIA

20. Technical Correspondence

ATTENTION : MR. SAHAPONG NOPCHAROEN

TELEPHONE No. : +66 81 255 9753

E-MAIL : SAHAPONG.N@PTTPLC.COM

21. Other Requirements

Responsibility, in any case, the contractor cannot claim they do not know the facts or information as mentioned above of their benefit.

1. Transport of the materials, chemicals, machinery, equipment and various substances, including the transport vehicles need to consider conservation of the environment without causing overflow, leak, littering along the way or releasing of a substance, emissions and toxic elements exceeding the standards established by the law.

2. The delivered products to be imported to use in the Rayong gas separation plant shall not have an element of asbestos or ozone –destroying substance of the atmosphere as refers to the notice of the EPA, the Clean Air Act, and Section 602.

3. Collection, transport, recovery and disposal of waste from Rayong gas separation plant activities must be comply with procedure QSHEP-GSP-19-022 "Waste Control generated by processing, maintenance and office" through the ISO 14001 "Operational Control"



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network																	
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division													
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4. The delivered product for using in the Rayong gas separation plant that is involved with the significant use of energy, e.g. the compressors of the air conditioning or other equipment shall be certified as energy saving from the manufacturer. They shall have a certificate or a certification in accordance with the industrial standards or the equivalent. In the case there is no such the certification, the delivered product shall be assessed after the installation.

5. The deliverer/subcontractor shall promote environmental responsibility and collaborate with PTT on the Energy Saving

6. In hiring involved with the system of managing energy, it has to make a report summarizing the evaluation of the use of energy delivered simultaneously to complement the job inspection.

7. So as the procurement of the goods shall comply with the Thai Labor Standards (TLS) 8001, the PTT reserves the right to consider selecting the traders in the group certified by the TLS 8001 or the traders who can show the determination in the operation according to the TLS 8001 with the guidelines in showing the following determination.

7.1 The deliverer/subcontractor shall not support the use of forced labor in all forms.

7.2 The deliverer/subcontractor shall pay the working wages and compensation a minimum as stipulated by the law.

7.3 The deliverer/subcontractor shall not do or promote discrimination when there is hiring, paying the wages and fringe benefits due to the difference on ethnicity, gender, religion, pregnancy, marriage, union membership and no prejudice due to disability or HIV positivity.

7.4 The deliverer/subcontractor shall not do or promote physical or mental punishment or using force, threat, assault their employees, including there are measures to prevent from sexual molestation by showing in words, gesture, physical contact or any other methods, and no punishment of the employees by deducting a salary or reducing their wages.

7.5 The deliverer/subcontractor shall not allow their female employees to do the job that is hazardous to health and body as prescribed by the law.

7.6 The deliverer/subcontractor shall have measures on occupational safety, health and environment so they can work safely and provide fringe benefits as prescribed by the labor law.

7.7 The PTT shall have no policy to promote using child labor at the age below 18 years old.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
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7.8 The deliverer/subcontractor shall comply with the Labor Protection Act 1998 and its amendment, including other laws involved and must be consistent with the requirement on Thai labor standards.

7.9 The deliverer/subcontractor shall notify the PTT gas separation plant for acknowledgement in the case the business relations with the other deliverers in the activity to be responsible with the PTT gas separation plant.

8. The Rayong gas separation plant has the system of managing to assess the traders after the delivery. In a situation that any trader is assessed with the result is less than established by the Rayong gas separation plant; it shall give a warning letter for acknowledgement, and shall collect as information in the annual evaluation of the traders. However, the traders who fail the annual evaluation shall be removed out of the Rayong gas separation plant Approve Vender List.

9. The contractor shall comply with the notification of the Department of Welfare and Labor Protection on training of safety by preparing the documentary evidence certifying the training course on occupational safety, health and environment totaling six hours. As for those to come to work in the Rayong gas separation plant, they shall submit such the certificate to the inspector or the coordinator to record in the access control system from 1 September 2013 onwards. If the contractor fails to comply with it, it is at the discretion of the PTT to consider allowing working in the Rayong gas separation plant or not.

22. General safety rules (with reference to the occupational safety, health and environmental protection (QSHEP-GSP-11-006))

The practical requirement for the employees and the operators in the responsible area of Rayong gas separation plant or inside the PTT area or under the Operational Control of PTT

1. Working shall comply with the manual and standards by not doing anything that is risking a danger.
2. They shall inspect the safety condition in working area before starting to work each time.
3. Report to the superiors or the inspector promptly upon there is an accident, near- miss accident and upon seeing an action or situation that may cause an accident, damage to life, property and the environment.
4. The workplace shall not have an excess or unnecessary thing, and shall arrange them in order.
5. The tools, machinery, equipment and vehicles shall be inspected in accordance with the schedule, and shall be used suitable with the job correctly. When there is defect/damage, it shall report to the superior or job inspector promptly.
6. Usage, adjustment, change or repair of any equipment shall be performed by the authorized person only.



Subject : จัดจ้างก่อสร้างโครงการ GSP Optimal Fuel Gas Network					
By : MR. TEERAYUT NIMNUY MR. SAHAPONG NOPCHAROEN MR. NATTAPONG KOCHAKARN MR. TANUPAT WONGTAPHA MR. PANUWAT TOHSAKUL		Create date : 07 April 2023 Rev.1 SAP PR No.1120018712		Division/Department : Technical and Asset Engineering Division	
<div style="text-align: center;">Related standard systems</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> Quality </div> <div style="text-align: center;"> <input type="checkbox"/> Safety </div> <div style="text-align: center;"> <input type="checkbox"/> Health </div> <div style="text-align: center;"> <input type="checkbox"/> Environment </div> <div style="text-align: center;"> <input type="checkbox"/> Lab </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> Energy </div> </div>					

7. In case of working in the plant area, They shall dress properly with long-sleeved shirts, long pants and wear the personal protection equipment (PPE), e.g. a helmet, safety shoes and including equipment personal protection in accordance with the work standardized by the law. When coming to working in Central Control Room (CCR), They shall wear long-sleeved shirts and long pants as well

8. It is prohibited from gambling, drinking alcohol or consuming intoxicated things and no teasing during working in the plant area.

9. It is prohibited from bringing in or consuming illegal narcotics of all types in all the area of the PTT.

10. No property of PTT Company may be taken without permission. The persons who are found to be guilty of theft shall be subject to legal actions.

11. Smoke and fire are strictly prohibited throughout the plant and all building areas.

12. Follow emergency plans, regulations, warning signs and instructions strictly.

13. Vehicles, engines, electrical tools, cameras, and other equipment that may sparks cause of fire into the plant area. Must be checked and issue a license permission by PTT.

14. Limit of speed is not exceeding 20 km/h for plant area and outside the plant area is not exceed 40 km/h.

15. New employee and contractor are required to attend safety training before working in the plant area and must be reviewed at least once a year or every 6 months.

เนื่องจากข้อจำกัดของขนาดไฟล์แนบในระบบ

บริษัทที่สนใจเข้าร่วมประมูลสามารถขอรายละเอียดข้อกำหนดฉบับสมบูรณ์

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ภายในวันที่และเวลาที่กำหนดไว้บนหน้าประกาศ