

**PHILIPPINE NATIONAL OIL COMPANY INDUSTRIAL PARK (PIP)**  
Batangas Dos, Mariveles, Bataan

**TERMS OF REFERENCE (TOR)**

**Project :** Assessment of Jetty Facility and Hydrographic Survey  
**Justification:** To determine the status of the PNOC Industrial Park (PIP) Jetty Facility Structure, both under and above water structure.  
**Project Location:** PNOC Industrial Park, Barangay Batangas Dos, Mariveles, Bataan

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**BACKGROUND/RATIONALE:**

The existing PNOC-Industrial Park (PNOC-IP) Jetty facility at Bgy. Batangas Dos, Mariveles, Bataan is a 1.3-km long, L-type pier (800 meters + 500 meters), with approximately 565 piles, and with an inner berth of 8-meter draft, and an outer berth of 10-meter draft. The jetty facility was built to service the feedstock delivery requirements of the Park's Locators in the discharging of their raw materials for their operations. Philippine Resins Industries, Inc. (PRII), Petron Corporation Polypropylene Plant (PCPP), and NPC Alliance (NPCA) have their own pipelines on the jetty that directly transport raw materials from their ships, through the jetty, and straight to their facilities.

The jetty facility structure is comprised of roadways, steel pipe racks, catwalks, mooring and breasting dolphins, loading platforms, fenders, and other ancillary structures. The main jetty superstructure was constructed using steel frames that supports a roadway, consisting of precast concrete slabs and expanded metal with steel frames. The substructure was constructed using reinforced concrete pile caps and beams with tubular steel piles (vertical and battered) protected by a concrete jacket. In 2011, a Fibre Reinforced Polymer (FRP) replaced the concrete jacket.

Currently, the structure is showing signs of widespread corrosion: corroded supports, base deteriorations, and base separations, among others, which could affect its structural integrity.

**1. OBJECTIVES**

- 1.1 To undertake the comprehensive assessment of the state, condition, and structural integrity, of the whole jetty structure with particular attention to the following: railings, roadways, steel pipe racks, catwalks, mooring and breasting dolphins, loading platform, fenders, and other ancillary structures, and beams;
- 1.2 To recommend the appropriate repairs and upgrade works for the jetty for it to be capable of handling the current and additional operational loads;
- 1.3 To conduct the hydrographic survey particularly on the approaches and immediate vicinity of the berth spaces.
- 1.4 To prepare the bidding documents including Scope of Work, detailed cost estimates, bill of materials and bill of quantities for the bidding of the proposed repairs and rehabilitation works.

## **2. SCOPE OF WORK:**

The Consultant shall undertake a comprehensive assessment (underwater and above water) of the existing Jetty Facility, to include among others, the lighting system and supports, newly-installed Fiber Reinforced Polymer (FRP); provide a comprehensive and detailed information on the structural integrity of the Jetty; and recommend repairs and upgrade works to enable the jetty to handle the current and additional operational loads.

In particular, the Consultant shall perform the following:

### **Phase 1 – Field Investigation and Survey Works**

#### **A. Field Investigation and Damage Mapping**

The field investigation will be a global visual examination to obtain an overview of the structural condition and deterioration process, if any. A detailed visual examination of the exposed surfaces will be conducted to determine any signs of spalling, cracks, deflections, corrosions and other visible damages. A Condition Assessment Report will be prepared including Damage Mapping Drawings where the damages will be mapped out in the drawings.

A set of drawings reflecting the sizes, location, and present condition of structural elements based on inspection and actual measurements will be prepared to show the visible aspects of the critical structural elements. Such drawings will also indicate damages found during the investigation with emphasis on the quantitative and qualitative description of the damage. Extensive photos shall be taken indicating the type and extent of the defects of each damaged structural element.

During the field investigation, the following shall be done:

- Inspect all structural elements for cracking patterns that may signify possibility of alkali aggregate reactivity or structural distress;
- Identify and assess the existence of corrosion-related spalling for concrete elements;
- Identify and assess the presence of corrosion for steel elements;
- Identify and assess any areas of damage or poor quality of workmanship;
- Identify and assess any deviation from intended use, misuse and abuse that can result in overloading;
- Identify any addition or alteration works that can result in overloading or adverse effects on the structure; and
- Identify and assess any possible settlements, deflections and movements that may have occurred on the structure and its parts.

#### **B. As-Built Survey and As-Built Drawings Preparation**

An accurate structural layout and details of the structure are necessary for the structural evaluation. Thus, an actual as-built survey to determine the as-built information of the jetty will be performed.



The actual measurements of the existing structural elements for the jetty will be undertaken to verify their dimensions and properties. The existing steel reinforcements for the reinforced concrete members will be determined by means of a ferrosan/rebar scanning and/or actual concrete cover removal to determine the size and quantity of the rebars.

The jetty as-built drawings will be prepared in CAD format and will be considered in the assessment.

### **C. Material Testing**

Material testing will be performed to establish the material strengths at the current time. Representative tests will be carried out at selected locations of the jetty, specifically the major structural elements to estimate the actual material strength and durability condition to support the structural evaluation.

This will include the following:

- **Concrete Coring and Compressive Strength Test**

The reinforced concrete structural elements of the jetty will be cored to extract several cylindrical concrete samples. At the minimum, 10 core samples will be extracted from the jetty structure. Rebar scanning shall be performed before extracting the core samples to avoid damaging the rebars.

The core samples taken from strategic locations of the structure will be subjected to compressive strength test. Results from this test will be the basis of the assumption of concrete strength that will be used in the assessment of the existing structure.

- **Concrete Rebound Hammer Test**

In addition to core testing, a concrete rebound hammer test will be performed to determine the compressive strength and consistency of the concrete. At the minimum 50 test samples, to be undertaken at the different locations of the jetty structure, shall be conducted.

- **Reinforcing Steel Bar Extraction and Tensile Strength Test**

Samples of reinforcing steel bars, with about one meter in length, will be extracted from the existing structure at randomly selected locations and will be subjected to tensile strength test. At the minimum, three ( 3) rebar samples will be taken.

### **D. Underwater Survey**

An underwater survey will be carried out to ascertain the degree of degradation of the existing piles. This will establish the base case for the strength of the jetty structure, which is likely to be critical in deciding on a suitable and cost-effective strengthening system.

A sample set of about 150 existing piles will be randomly selected. The surfaces of these selected piles will be cleaned of marine growth and agglomerations prior to underwater inspection and photography, including underwater video. In addition, a swim past will be made on all remaining piles supporting the pier structures.



An Underwater Survey Report with photo and video documentation will be prepared and submitted to the client.

## **E. Hydrographic Survey**

A hydrographic survey, the study of the bed/floor of a waterbody, involving mapping of features on charts to provide information on water depth of the harbor area and navigation channel, and which may require the preparation of bathymetric charts, will be performed, to include the approaches and immediate vicinity of the berth spaces. This includes performing sounding to determine the seabed elevations. This will be the basis for the pier elevations and delineation of the required dredging limits within the harbor, if necessary.

### **1 Conduct of Technical Study**

- 1.1 Conduct an assessment of the existing technical and operational condition of the port and its related facilities, and determine possible improvements in terms of structural integrity and lighting system to meet future demand.
- 1.2 Prepare a preliminary cost estimate of the rehabilitation of the jetty port based on the results of the assessment.
- 1.3 Study existing operational structure.

### **2 Advise and assist PNOC based on the results of the assessment.**

- 2.1 Advise PNOC on the results of the conduct of the detailed assessment of the jetty port.
- 2.2 Advise PNOC on the best mode of project implementation.
- 2.3 Advise PNOC on the timeline of project implementation.
- 2.4 Prepare all construction drawings, specifications, general conditions and other necessary tender documents, for bidding purposes based on the revised IRR of R.A. 9184.

## **Phase 2 - Structural Analysis and Evaluation**

After conducting all the field investigation and survey works, a structural engineering analysis of the jetty structure will be performed that will consist of the following:

### **A. 3D Computer Modelling and Analysis**

A finite element three-dimensional mathematical computer model of the jetty structure will be performed using appropriate structural software to evaluate the distribution of the design loads throughout the structure, and the bending moments, shears and axial loads generated in each member. The 3D computer model will enable full interaction between directly loaded elements and those elements in the vicinity, which will greatly assist in load distribution.



The load-carrying capacity of the structure, including seismic evaluation, will be determined by the structural analysis following recognized principles as outlined in the current National Structural Code of the Philippines (NSCP) and Philippine Ports Authority (PPA) - Engineering Standards for Port and Harbor Structures.

## **B. Structural Evaluation**

Once validated for the existing structure, the 3D computer model will be used to determine the structure's current structural capacity and serviceability.

The overall structural adequacy and capacity of the jetty as a whole as well as its individual structural elements (i.e. piles, beams, slabs, trusses, etc.) will be determined in compliance with the provisions of the current NSCP and PPA standards.

## **C. Preparation of Technical Report**

A technical report will be prepared and submitted to the Client, which presents all the results of the field investigation, material testing, site surveys, structural analysis and evaluation executed for the structure. This report will also contain conclusions on the structural soundness and integrity of the jetty structure. Should the study indicate that the existing condition and capacity of the jetty is deficient, a need to perform a retrofitting design for the structural rehabilitation of the jetty will be recommended.

## **Phase 3 - Detailed Engineering Design**

### **A. Detailed Engineering Analysis and Design**

Should the structural analysis and evaluation indicate that there are structural deficiencies and non-compliant elements with the provisions of the National Structural Code of the Philippines (NSCP) and Philippine Ports Authority (PPA) standards, Contractor will commence with the detailed engineering design that consists in the formulation of various retrofitting options, which aims to provide proper repair and retrofitting analysis, strategy and design to be able to present solutions based on considerations of cost, durability, constructability and compatibility with the existing structure.

Various methods for retrofitting the deficient structural elements will be investigated, and all suitable systems will be evaluated on the basis of cost and compatibility with the existing structural members, as well as minimum interference with the continued operation of the jetty facilities during their installation. This consists of a formulation of concepts for all viable strengthening systems. The most economical and most suitable option will be selected for recommendation.

### **B. Detailed Design Documentation**

The detailed design documentation will be prepared based on the detailed engineering design performed for the project. This will include the following:

## **1. Detailed Engineering Design Drawings**

The detailed engineering design drawings will be prepared reflecting the final detailed design performed for the project. These drawings will enable the client to have a general view of the works anticipated; eventually, these will be used to determine the construction costs and will be used for permit and construction purposes of the project.

## **2. Technical Specifications**

The technical specifications will consist of the Government Accepted Standard Specifications including Special Provisions for specific items of work or methods of construction, measurement and payment, which are not covered by the Standard Specifications.

The technical specifications will cover aspects of the works, namely:

- a. Scope of Work;
- b. The Character and Quality of the materials and workmanship;
- c. Detailed Definition of Systems and Equipment; and
- d. Methodology and Order of the Execution of the works.

## **3. Detailed Cost Estimates**

The Detailed Cost Estimates, Detailed Unit Price Analysis, and Summary of Works will be prepared based on the prepared working drawings, and within the accuracy acceptable for such works. Items of work will comprise all the works to be executed for completion of the Project and be referred to the work items.

The Bill of Quantities and Materials (BOQ/BOM), which includes the estimates of materials, manpower and machineries/equipment, will have a detailed definition of each item of the work, so as to clarify what incidental cost will be compensated by the item.

## **4. Design Calculations**

The structural design calculations will be prepared reflecting the detailed analysis and retrofitting/rehabilitation design performed for the project. These include the design criteria and standards, computer models, analysis inputs and outputs, design procedures and other applicable design calculations.

## **5. Program of Work / Project Schedule**

A program of work depicting the general schedule and estimated cash flow for the construction of the project will be prepared in the form of a bar/work plan/schedule/Gantt chart with S-curve or PERT-CPM method. The various work phases and work activities will be provided indicating their corresponding time duration and project milestones.

## **C. Bid/Tender Documents**

Prepare the bid tender documents required for the bidding of the repairs and rehabilitation works based on the assessment conducted in accordance with RA 9184, This includes

The Terms of Reference, Approved Budget for the Contract (ABC), Invitation to Bid, Instruction to Bidders, General Conditions of Contract, Form of Bid, Tender Drawings and Technical Specifications.

### 3. DELIVERABLES

The Deliverables shall include the following:

#### **Work Phase**

##### **Phase 1 - Field Investigation and Survey Works**

- |  |        |
|--|--------|
| <input type="checkbox"/> Condition Assessment Report w/ Damage Mapping | 3 sets |
| <input type="checkbox"/> As-Built Drawings                             | 3 sets |
| <input type="checkbox"/> Material Testing Results                      | 3 sets |
| <input type="checkbox"/> Underwater Survey Report                      | 3 sets |
| <input type="checkbox"/> Hydrographic Survey Map                       | 3 sets |

##### **Phase 2 - Structural Analysis and Evaluation**

- |   |        |
|---|--------|
| <input type="checkbox"/> Structural Assessment Technical Report | 3 sets |
|---|--------|

##### **Phase 3 - Detailed Engineering Design**

- |   |         |
|---|---------|
| <input type="checkbox"/> Detailed Engineering Design Drawings | 10 sets |
| <input type="checkbox"/> Technical Specifications             | 10 sets |
| <input type="checkbox"/> Detailed Cost Estimates              | 5 sets  |
| <input type="checkbox"/> Design Calculations                  | 5 sets  |
| <input type="checkbox"/> Program of Work/Project Schedule     | 5 sets  |
| <input type="checkbox"/> Bid/Tender Documents                 | 5 sets  |

### 4. EXCLUSION

At the time of engagement and for its duration, the Consultant shall inhibit himself from any direct and indirect interests with any potential and/or strategic investors.

### 5. TIMELINE AND DELIVERABLES

#### 5.1 Commencement Date and Period of Implementation

The commencement date of the engagement period shall be on the date of the issuance of Notice to Proceed. The engagement shall be completed within a period of 120 days from the commencement date.

## 5.2 Table of Deliverables

The deliverables for the engagement, as enumerated in the table below, shall be submitted by the winning bidder in both hard and electronic copy, together with the materials that were used to produce the deliverables.

Table of Deliverables with corresponding Timelines

1	<p>Mobilization and preparation of the detailed methodology, work schedule, and preliminary assessment</p> <p>Phase 1 – Field Investigation and Survey Works</p> <ul style="list-style-type: none"> <li>▪ Condition Assessment Report with Damage Mapping</li> <li>▪ As-Built Drawings</li> <li>▪ Material Testing Results</li> <li>▪ Underwater Survey Report</li> <li>▪ Hydrographic Survey Map</li> </ul>	<p>3 sets</p> <p>3 sets</p> <p>3 sets</p> <p>3 sets</p> <p>3 sets</p>	Week 1 - 8
2	<p>Progress reports: Detailed inspection and testing above water structures</p> <p>Phase 2 – Structural Analysis and Evaluation</p> <ul style="list-style-type: none"> <li>▪ Structural Assessment Technical Report</li> </ul>	3 sets	Week 9 - 12
3	<p>Interim report preparation to include the following:</p> <p>Phase 3 – Detailed Engineering Design</p> <ul style="list-style-type: none"> <li>▪ Detailed Engineering Design Drawings</li> <li>▪ Technical Specifications</li> <li>▪ Detailed Cost Estimates</li> <li>▪ Design Calculations</li> <li>▪ Program of Work / Project Schedule</li> <li>▪ Bid / Tender Documents</li> </ul>	<p>10 sets</p> <p>10 sets</p> <p>5 sets</p> <p>5 sets</p> <p>5 sets</p> <p>5 sets</p>	Week 13 - 16



**6. EXPERTISE REQUIREMENTS**

	Expertise	Qualification	Experience
1	Project Manager	Licensed Civil/Structural/Electrical Engineer	<ul style="list-style-type: none"> <li>▪ At least 2 years experience in jetty structure assessment</li> <li>▪ Experience in preparation of assessment reports</li> </ul>
2	Team Leader/Port Development Specialist	Licensed Civil/Mechanical/Chemical/Electrical Engineer	<ul style="list-style-type: none"> <li>▪ At least 2 years experience as Team Leader handling projects related to port facilities</li> <li>▪ Has satisfactorily completed at least 2 projects as Team Leader for jetty port assessment</li> </ul>
3	Hydrologist Engineer	Licensed Engineer	<ul style="list-style-type: none"> <li>▪ At least 2 years experience in conducting hydrographic survey for a port facility</li> <li>▪ Has satisfactorily completed at least 2 projects as Hydrologist for jetty port assessment in conducting hydrographic survey</li> </ul>
4	Safety Specialist	Licensed Safety Practitioner	<ul style="list-style-type: none"> <li>▪ At least 2 years of cumulative experience as Safety Practitioner</li> <li>▪ Has satisfactorily completed at least 2 projects on jetty port facility</li> <li>▪ Knowledgeable on DOLE requirements at work places</li> </ul>
5	Divers	Certified Diver	<ul style="list-style-type: none"> <li>▪ Knowledgeable in underwater assessment</li> </ul>

The winning bidder shall define the organization of the Project in terms of specific positions and tasks, including the abovementioned profiles. This information will be provided as a description (indicating the names, profiles, and position in the proposed Project organization) supported by a schematic sheet with a clear indication of the functions and dependencies.

Resumes detailing the educational background, work experiences (highlighting the experiences set in the TOR) and other qualifications of each of the project team members shall be attached. The prospective bidder-firms shall present proof to support their credentials as well as those of each of their members, such as the list of previous assessments conducted and certificates of employment from previous employer. Any misrepresentation made, orally or in writing, in any of the credentials and its supporting documents submitted, whether pertaining to the firm or to any of its members, shall be a ground for disqualification.

To ensure transparency and fairness in the conduct of the selection process, as well as to assure prospective bidders of PNOC's adherence to the highest standards of professionalism and accountability, persons or entities, whose ownership or top management is composed of persons who were former employees, officers, directors, shall be disqualified from bidding.

## **7. CRITERIA FOR THE SELECTION**

The interested bidders shall be evaluated in accordance with the Implementing Rules and Regulations of RA 9184. Specifically, the evaluation and selection of qualified winning bidders shall follow Section 33.2.1(b) the quality-cost based evaluation procedure. Thus, interested winning bidders shall submit both the technical and the financial proposals, which shall serve as the basis for selection. The technical and the financial proposals shall be evaluated based on the allocation weights of 85% and 15%, respectively.

### **7.1. Technical Proposal (85%)**

The interested bidder shall provide their technical experience, approach and methodology on all technical and cost parameters detailing professional inputs and time requirements, and resumes of all proposed technical manpower.

The proposal shall be based on the following criteria and point system:

#### **7.1.1. Technical Proposal (20%)**

The technical proposal will be evaluated on the following aspects:

- The coordination and project management procedures and tools application methods.
- The specific methodology for the above water structures and its ancillaries and below water structural integrity test and hydrographic survey.
- Work Plan

The work plan should include the proposed main activities of the assignment, their content and duration, phasing and interrelations, milestones and delivery dates of the reports. It should be consistent with the technical approach and methodology, showing understanding of the TOR and ability to translate them in a feasible working plan. A list of the final documents, including reports, drawings, and tables to be delivered as final output, should be included in this component.

- **Organization and Staffing**

The bidder shall prepare the proposed structure and composition of the team. The bidder should list the main disciplines of the assignment, the key expert responsible, and proposed technical and support personnel.

**7.1.2. Technical Team (55%)**

The technical team will be evaluated on the following aspects:

- Experience and qualification of the technical experts, and the composition of the team as a whole, according to the profile requirements as enumerated in Section 6 of this TOR.

**7.1.3. Company Qualifications (10%)**

- Comprehensive knowledge and extensive experience in hydrographic survey, jetty port assessment and management in the Philippines and/or overseas.
- Extensive experience in hydrographic survey and port jetty facility-related activities.

**7.2. Financial Proposal (15%)**

PNOC shall require a detailed financial proposal with indicative program and milestones, and target estimates for defined outputs.

**8. APPROVED BUDGET FOR THE CONTRACT**

The budget allotted for the project is **FOUR MILLION EIGHT HUNDRED THOUSAND PESOS (P4,800,000.00) inclusive of VAT, all taxes and charges.**

**9. MODE OF PAYMENT**

The Consultant shall be paid based on various milestones achieved. The payment shall be released based on the approval of PNOC of the outputs delivered, after ensuring that these outputs conform to the requirements set for the purpose.

The table below describes the payment scheme:

Milestone	Percentage of Payment
1. Mobilization	10%
2. Acceptance of Inspection Report and Estimation Report	5%
3. Acceptance of all reports, drawings, result and mappings on Field Investigation and Survey Works <ul style="list-style-type: none"> <li>• Condition Assessment Report with Damage Mapping</li> <li>• As-built Drawings</li> <li>• Material Testing Results</li> <li>• Underwater Survey Report</li> <li>• Hydrographic Survey Map</li> </ul>	35%

4. Acceptance of all Reports on Structural Analysis and Evaluation	20%
• Structural Assessment Technical Report	
5. Acceptance of all Reports on the Detailed Engineering Design and Bid Tender Documents	30%
• Detailed Engineering Design Drawings	
• Technical Specifications	
• Detailed Cost Estimates	
• Program of Work/Project Schedule	
• Bid Tender Documents	
TOTAL	100%

All payments shall be subjected to the usual government accounting and auditing requirements.

**10. TAXES AND DUTIES**

The Consultant, whether local or foreign, shall be entirely responsible for all the necessary taxes, stamp duties, license fees, and other such levies imposed for the completion of this Contract.

**11. PERFORMANCE SECURITY**

11.1 Within 10 calendar days or less, as indicated in the Instructions to Bidders, from receipt of the Notice of Award, the winning bidder shall enter into a contract with the Procuring Entity and furnish the Performance Security required in Section 39 of the IRR, except when Section 37.1 of the IRR allows for a longer period.

11.2 The performance security posted in favor of the Procuring Entity shall be forfeited in the event it is established that the winning bidder is in default in any of its obligations under the contract.

11.3 The performance security shall remain valid until issuance by the Procuring Entity of the Certificate of Final Acceptance.

11.4 The performance security may be released by the Procuring Entity and returned to the Supplier after the issuance of the Certificate of Final Acceptance subject to the following conditions:

- (A) There are no pending claims against the Consultant or the surety company filed by the Procuring Entity;
- (B) The Supplier has no pending claims for labor and materials filed against it; and
- (C) Other terms specified in the Special Conditions of Contract.

11.5 In case of a reduction in the contract value, the Procuring Entity shall allow a proportional reduction in the original performance security, provided that any such reduction is more than ten percent (10%) and that the aggregate of such

reductions is not more than fifty percent (50%) of the original performance security.

## **12. LIQUIDATED DAMAGES FOR DELAY**

Should the Consultant fails to deliver any or all of the Services within the period/s specified, PNOC shall deduct from the contract price, as liquidated damages, a sum equivalent to one-tenth of one percent of the price of the unperformed portion of the services for each day of delay based on the approved contract schedule up to a maximum deduction of ten percent (10%) of the contract price. Once the maximum is reached, the Procuring Entity may consider termination of this Contract.

## **13. DEFINITION OF SIMILAR PROJECTS**

A project that involves structural assessment of jetty port facilities to include above and under water structures.