Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REGIONAL OFFICE VIII
Baras, Palo, Leyte

BAGONG PILIPINAS

TERMS OF REFERENCE

Consultancy Services for the Conduct of Feasibility Study for Structural and Foundation Analysis and Investigation on the Rehabilitation/Repair of San Juanico Bridge

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I. INTRODUCTION

The Department of Public Works and Highways, Regional Office VIII (DPWH-RO VIII) intends to engage the services of qualified and experienced experts to undertake the structural assessment and design for the rehabilitation and retrofitting of the San Juanico Bridge, Along Daang Maharlika.

A. BACKGROUND

The Government of the Philippines (GOP), through the Department of Public Works and Highways (DPWH), shall engage the services of a Consultant to provide the Design for the Rehabilitation and retrofitting of the San Juanico Bridge (B00018LT), Tacloban City.

Name of Bridge:	San Juanico Bridge
Location:	Daang Maharlika Samar - Leyte
Year Built:	1972
Posted Load Limit:	13.5 T
No. of Lanes:	2- Lane
Lanes per Direction:	1 Lane
Total Length:	2,160 m
Superstructure:	Box – Truss – I girder
Substructure:	Circular Column
Foundation:	on Piles – Rock Seat

On July 17 – 23, 2022, personnel from DPWH Regional Office VIII together with the Bureau of Design and Bureau of Research and Standards conducted an ocular engineering inspection and NDT and Destructive testing of the San Juanico Bridge. Preliminary evaluation shows an alarming state of the San Juanico Bridge wherein two scouring areas has developed on its foundations, hence, a detailed structural assessment of the structure is necessitated.

B. PROJECT DESCRIPTION

The San Juanico Bridge connects the islands of Leyte and Samar by linking the city of Tacloban to the town of Santa Rita, Samar. It passes over the San Juanico Strait. The road infrastructure is the second longest bridge spanning a body of seawater in the Philippines measuring 2,164 m (7,100 ft) in total length. It has 43 steel spans with the primary span measuring 192 m (630 ft). The bridge's abutments are founded on steel H-piles while its piers are rock seated pedestals built using the Prepakt method, having single cylindrical shafts and tapered cantilevered copings.

The bridge is part of the Pan–Philippine Highway (commonly known as the Maharlika Highway), a network of roads, bridges, and sea routes that connect the islands of Luzon, Samar, Leyte, and Mindanao in the country. The highway was proposed in 1965, and constructed under the administration of President Ferdinand E. Marcos to serve as the country's backbone of transportation.

During the conduct of ocular inspection and tests on the bridge, it was found that scouring had developed on its foundations, thus, it was recommendation was to conduct a detailed structural assessment of the bridge through the services of a qualified and competent experts, hence, this consulting services project.

II. OBJECTIVES OF THE CONSULTING SERVICES

The Consulting Services aims to competently improve the existing condition of the bridge, load carrying capacity and resistance to disastrous seismic activities.

III. SCOPE OF SERVICES

The consulting services shall involve the structural assessment and design work for rehabilitation and retrofitting of the San Juanico Bridge. The scope of works shall include the conduct of detailed assessment of the bridge to consider the actual dimensions of each member and the observed defects and determine the extent and nature of improvements required, technical justifications for the possible improvements.

The consultant shall also prepare detailed structural analysis, technical studies, reports, plans and drawings, cost and quantity estimates, program of work, prequalification and bidding documents in accordance with Republic Act 9184, and other documents, as required. In addition, the consultant shall provide manual which can be used as reference in maintenance works, and damage and deterioration prevention of the San Juanico Bridge to ensure public safety and continuous economic development.

A. GENERAL

1. Conduct necessary field investigations and surveys to obtain actual data of the existing structure, mapping/identification of the existing defects and survey of the "As-found" dimensions of each structural members and all other parameters necessary to perform the Technical Studies and Detailed Engineering.

2. Conduct necessary non-destructive tests for determination of size, dimensions and spacing of bars as well as concrete compressive strength as basis of assessment.

3. Conduct soil exploration for reference in the structural modeling and in the design of foundation retrofit.

4. In case of foundation located in bodies of water, conduct underwater exploration for the detailed assessment of the existing foundation.

5. Perform overall detailed analysis/assessments of the existing bridge and determine the most suitable rehabilitation and retrofitting schemes, if necessary, by means of preparation of Technical Studies.

6. Produce a detailed engineering design plans of the recommended rehabilitation and retrofitting works for the whole bridge structure.

7. Produce quantity estimates and corresponding Detailed Unit Price Analyses (DUPA) and Program of Works (POW) for the rehabilitation and retrofitting works.

8. Provision of tender documents for the procurement of civil works contracts, such as but not limited to Bill of Quantities (BOQ), Precedence Diagram Method (PDM), Cash Flow, Technical Specifications, General and Special Conditions of the Contract in accordance with Republic Act 9184.

9. Establish and maintain proper coordination with the Regional/District Offices of the DPWH, and concerned Local Government Units for consultation on any project-related issues and concerns.

10. In the preparation of plans, use Computer Aided Design (CAD) software. After completion of the detailed design, all electronic files of reports, plans and drawings and other relevant documents shall be turned over by the Consultant to DPWH.

11. Secure permits and Clearance on the operations to conduct various test during the study.

12. Publish manual as guide for future rehabilitation and retrofitting which will include methodologies and cost estimate for the bridge.

B. ASSESSMENT AND INVESTIGATION OF THE EXISTING STRUCTURE

1. Design Data Collection

1.1. Field Survey

a. The Consultant shall gather and review all the necessary data (topographic and geologic maps of the territory, climatology reports, hydrologic maps, local drainage system plans, flood control project plans, etc.) related to the project and coordinate with DPWH-Regional Office VIII.

b. The Consultant shall conduct joint bridge survey activities with a representative from the Implementing Office.

c. The Consultant shall undertake topographic and hydrographic surveys of the bridge site and vicinity taking into consideration the important features, and shall conform to the requirements stipulated in DPWH Design Guidelines, Criteria, and Standards (DGCS), 2015 Edition, Volume 2B-Engineering Surveys and applicable provisions of existing laws, codes or Department Orders.

d. The Consultant shall conduct field survey and measurement of structural members for preparing the structural as-found drawings.

e. Conduct profiling to determine any displacements and deformation of the structural members of the bridge.

f. Conduct profiling of cracks on deck slabs, piers, concrete arches, sidewalk, etc.

g. The consultant shall conduct investigation to determine the existing above-ground, underground, and underwater structures/utilities that might be affected by the rehabilitation and retrofitting works on the bridge.

1.2. Field Investigation

1.2.1. Bridge Investigation

a. The Consultant shall use non-destructive testing to the maximum extent possible in the conduct of bridge investigation to determine measurements of the bridge components such as abutments, piers, and foundation including all installed reinforcements and elements. The following equipment shall be used, but not limited to:

-Microcore Drilling Set
-Ultrasonic Pulse Velocity Tester
-Rebar Scanner/Locator
-Magnetic Digital Concrete Rebound Hammer

b. The Consultant shall prepare reports to identify the following:

- Existing defects on bridge components
- Existing foundation, conduct underwater investigation
- Performance of the bridge in the past floods and earthquakes
- Size, dimensions and spacing of structural steel members, rebars as well as concrete compressive strength using non-destructive tests.

1.2.2. Geological and Geotechnical Investigation Report

a. For reference in the structural modeling and in the design of foundation rehabilitation and retrofitting, the Consultant shall conduct Geological and Geotechnical Surveys/Investigations, consisting of, but not limited to, geotechnical exploration to the prescribed depth from the sea bed at the actual bridge site abutments and piers in accordance with the requirements of the DPWH DGCS, Volume 2C - Geological and Geotechnical Investigations 2015 Edition, Department Orders, and other pertinent laws relative to the conduct of surveys and investigation.

b. The Geotechnical report and the laboratory testing shall have the following, but not limited to:

i. Determination of moisture content (ASTM D 2216)
ii. Grain Size Analysis (ASTM C136, ASTM D422)
iii. Atterberg Limit (ASTM D4318, ASTM D427)
iv. Specific Gravity (ASTM D854)
v. Unified Soil Classification
vi. Unconfined Compression for Undisturbed Sample (ASTM D2166)

vii. Consolidation (ASTM D 2435)
viii. Tri-Axial Test (UU) (ASTM D2850); Tri-Axial Test (CD) (ASTM 4767)
ix. Unconfined Compressive Strength of Intact Rock Specimens (ASTM D2938)
x. Soil Bearing Capacity
xi. Final Boring Logs
xii. Subsurface Conditions (Soil, Rock, Groundwater)
xiii. Liquefaction Analysis

c. The Consultant shall determine the soil bearing capacity, liquefaction potential and settlement on foundations of the bridge.

d. The Consultant shall be able to identify areas with geological and hydrological problems and difficulties, and shall conduct, but not limited to the following:

- Collection of available Geological information such as aerial photographs, tidal data, wind and wave data (25-year period), up-to-date satellite imagery, latest relevant geological study reports, documents and maps for the project area. All data shall be gathered first hand and from mandated agencies.

- Conduct of bathymetric survey including but not limited to geophysical and seismic surveys.

- Determine if the proposed bridge site is prone to foundation problems such as settlement and subsidence.

- Geological structures determined by PHIVOLCS onshore and offshore, especially active faults that might traverse the area, should be delineated and potential mass movement areas should be identified, analysis for Liquefaction Potential during earthquake and subsidence due to problematic soil should be included.

e. All geotechnical investigation results and reports for of the project shall be subject for review and evaluation by the Regional Office Technical Team in conformity with standard technical requirements for the DPWH projects.

2. Structural Analysis/Assessment

The Consultant shall undertake a detailed assessment of the individual bridge components such as structural steels, columns, pile caps, coping beams, foundation, etc., to include but not limited to the following:

a. Conduct Load Rating of the bridge to determine the actual bridge live load capacity. The Consultant may propose any accepted load rating methodology supported with detailed analyses.

b. The consultant shall determine the in-situ condition of the existing bridge and prepare the As-Found Plan.

c. The Consultant shall conduct field inspection of the bridge to verify the information obtained from various tests conducted on the bridge and to determine if there are:

- Damage or deterioration to the structural members;
- Erosion of soil at or near the foundation;
- Structural and non-structural items not shown on plans, such as the bottom steel beam to arch connection and continuous barrier rail that could affect the lateral stiffness of the structure or its performance under seismic loading;
- Horizontal or vertical movement or tilting of the abutments, columns, or piers.

d. The Consultant shall undertake an overall assessment of the current condition of the bridge based on the current load capacity and safety measurements such as Level of Service (LOS) and other network performance parameters or factors and identify potential rehabilitation and retrofitting measures;

e. The Consultant will prepare the **Structural Analyses and Assessment Report** and determine the most appropriate and economical method for rehabilitation and retrofitting of the bridge. The Consultant shall prepare the Technical Studies report which shall include but not limited to the following:

i. General Requirements
ii. Rating for Screening and Prioritization
iii. Assessment Method for Existing Bridge
iv. Destructive and Non-Destructive Test Report
v. Strength Capacity of Bridge Members
vi. Deformation Capacity of Bridge Members
vii. Rehabilitation and Retrofitting Strategy and Approach
viii. Rehabilitation and Retrofitting Measures for Bridge Members
ix. Comparative Matrix of Alternative Rehabilitation and Retrofitting Schemes for Bridge Members considering the cost, constructability, maintainability, aesthetics, environmental impact and others.

f. The Consultant may use any available design and analysis softwares for the assessment of the bridge. The Consultant shall prepare the necessary data inputs and comprehensively provide all the information required to run the model and clearly illustrate the output needed to evaluate the project. The Consultant shall provide a detailed form showing all the inputs and assumptions used in the model.

3. Detailed Engineering Design (DED) and Cost Estimates

Based on the selected Rehabilitation and Retrofitting Works determined in the Assessment and Technical Studies, the Consultant shall undertake the complete detailed engineering design and analyses for the Rehabilitation and Retrofitting of the bridge project in conformance with the applicable codes and specification, which include, but not limited to the following:

i. DPWH DGCS, Volume 5 - Bridge Design, 2015 Edition;
ii. DPWH Guide Specification Load and Resistance Factor Design (LRFD) Bridge Seismic Design Specifications, 1st Edition, 2013;
iii. DPWH Interim Revisions for LRFD Bridge Seismic Design Specifications, 2019;
iv. DPWH Guide Specification Seismic Retrofitting Manual for Highway Bridges, 1st Edition, 2019;
v. DPWH Standard Specification for Highway, Bridges and Airports, 2013 Blue Book;
vi. Other references may be used subject to the approval of the Implementing Office if a more detailed approach is required for a particular site.

Load Specifications

The existing bridge structure shall be rehabilitated and retrofitted to increase its resistance and ability to counteract for the following loads and forces:

i. Dead Loads – the dead load shall consist of the weight of the complete structure, including the roadway, sidewalks, car trails, pipes conduits, cables and other public utility services. Additional loads for future wearing surface should be added.
ii. Live Loads- Vehicular live loading designated as HL-93 shall consist of a combination of the following: Design Truck or Design Tandem and Design Lane Load, Permit Design Live Load
iii. Pedestrian Live Load
iv. Dynamic Load Allowance
v. Earthquake Load
vi. Thermal Force
vii. Wind Load
viii. Other Forces – when they exist as follows; longitudinal force, centrifugal force, water load, earth pressure, friction force, buoyancy, shrinkage stresses, rib shortening, erection stresses, vessel and vehicular collision forces, among others.

3.1. **Detailed Engineering Design (DED) Plan**

The Consultant shall prepare the DED Plans based on the data gathered for the bridge project. The Consultant shall prepare the plans in accordance with Department Order (D.O.) No. 55, series of 2020, Revised Guidelines in the Preparation of Detailed Engineering Design, "As-staked", Revised and "As-Built" Plans for Highway, Bridge and Water Projects. This shall include, but not limited to the following:

a. As-Found Plan of the Bridge
b. Existing Adjacent Structures that might be affected by the proposed Rehabilitation and Retrofitting Works
c. Location of Defects
d. Perspective View
e. Index of Drawing

f. Location and Vicinity Map
g. Topographic Plan and Bathymetric Plan
h. Summary of Quantities
i. General Notes of Structures
j. General Plan and Elevation showing Boring Data
k. General Plan and Elevation showing Schedule of Rehabilitation and Retrofitting Works
l. Sections and Elevation of Structure incorporating the Proposed Rehabilitation and Retrofitting Works
m. Construction Methodology
n. Safety and Health Program
o. Traffic Management Plan

3.2. Hydrologic/Hydraulic/Hydrodynamic Analyses

The Consultant shall conduct Hydrologic/Hydraulic/Hydrodynamic Analyses in accordance with the requirements of the DPWH DGCS Volume 3 Water Engineering Projects 2015 Edition, Department Orders, and other pertinent laws. Specifically, the consultant shall perform the analyses as described in Section 3 Hydrology, Section 4 Hydraulic Analyses, and Section 7 Coastal Structures, if applicable. The hydraulic analyses shall include at least:

a. Calculated backwater curves and mean velocities at the bridge opening for existing bridge lengths for the design flood.
b. The distribution of flow and velocities across the site for flood discharges must be considered in the assessment of the structure. Where two-dimensional flood modeling software has been used, maps showing the distribution of flow velocities and flow direction shall be provided for each calculated flood.
c. A level-discharge curve for the bridge site.
d. A comparison to historical floods and maximum floods of record (25-year period)

3.3. Bill of Quantities, Quantity Calculations Report and Cost Estimate

The Consultant shall prepare a Bill of Quantities (BOQ) and Quantity Calculations Report which shall be computed to an accuracy of ± 10%, together with a Cost Estimate utilizing the quantities and unit prices determined per their Unit Price Analysis mentioned above.

The estimate should be accompanied by a corresponding design and construction work schedule. An overview of expected quarterly expenditures shall also be prepared to consist of a PDM and PERT/CPM network diagram of design and construction activities, a bar chart with S-curve, equipment deployment schedule, manpower deployment schedule, and cash flow schedule.

Bridge maintenance costs, categorized into routine and periodic costs, shall also be calculated and appropriately distributed within the economic life time of the project bridge. Likewise, maintenance strategies shall be determined by the Consultant vis-à-vis actual condition.

Materials included in the bill of quantities which are not listed in the Construction Materials Price Data (CMPD) shall be provided with signed and sealed canvas of at least three legitimate suppliers validated by the Implementing Office.

3.4. Detailed Unit Price Analysis (DUPA)

The Consultant shall draw up a unit price analysis of each of the work items that shall be included in the civil works contract pursuant to Department Order 163, s. 2015 *"Standard Forms of Program of Works (POW), Approved Budget for the Contract (ABC) and Detailed Unit Price Analysis (DUPA)"*.

a. Direct Cost
   i. Cost of materials delivered to site
   ii. Cost of construction plant and equipment including depreciation or rental rates, wages of operators, fuel, oil lubricants and maintenance; and
   iii. Cost of labor, including salaries, wages, cost of living allowance and fringe benefits.

b. Indirect Cost
   i. Overhead, Contingencies, Miscellaneous;
   ii. Profit; and
   iii. Taxes

3.5. Technical Specifications, Special Provisions and Minimum Performance Specifications and Parameters

If necessary, the Consultant shall prepare technical specifications and special provisions for specific items of work or methods of construction, measurement, and payment that are not covered by the latest edition of DPWH Standard Specifications Volumes I & II and shall be submitted for approval at Central Office.

The Consultant shall also establish the minimum performance specifications and parameters for the bridge structure that include, but not limited to, the loading specifications, geometric standards/design specifications, design codes and guidelines to be followed, and material requirements which are to be used for the project.

4. Construction Methodology

The Consultant shall propose suitable and appropriate construction methodology on the execution of the proposed rehabilitation and retrofitting works included in the Detailed Engineering Design Plans, taking into consideration the application of value engineering.

4.1. Indicative Construction Schedule

Provide a realistic time schedule for implementing the various components of the project. This shall include sufficient lead time for procedural matters, design solicitation and award of tenders as well as for construction of the various project components.

5. Traffic Impact Assessment and Management

The Consultant shall prepare a Traffic Impact Assessment that indicates the estimated volume and flow of vehicular traffic and its impact on the bridge. The Consultant shall also prepare corresponding traffic management procedures which shall form part of the TIA such measures shall also be incorporated in the rehabilitation and costing of the project.

Traffic mitigation measures are to be proposed during the rehabilitation and retrofitting stage as well as the operation stage of the project for all the identified impacts.

- Selecting an alternate route; and
- Traffic Management and Control

The DPWH may require alternative solutions to allow for the determination of the most suitable traffic scheme during the implementation of the project.

6. Comprehensive Repair and Maintenance Manuals

The consultant shall provide manuals to serve as references in repair and maintenance works to prevent further damage and/or deterioration of the San Juanico Bridge for public safety and continuous economic development.

7. Technology Transfer

a. The Consultant shall provide on-the-job capacity building and knowledge and technology transfer to the Implementing Office.

b. The Consultant shall also conduct seminar and workshops for the Repair and Maintenance Manual and Retrofitting works to be done.

c. Software to be used in the retrofitting analysis, design and estimates shall be licensed. All data gathered and used in this contract shall be turned-over to the Implementing Office in editable format inside a Portable Storage Device/USB for the safekeeping of records for future reference of design, analysis and costing of retrofitting works.

d. All equipment and software purchased by the Consultant for the consulting services shall be turned over to Implementing Office upon completion of the project.

IV. IMPLEMENTATION

A. KEY STAFF QUALIFICATIONS

The Consultant shall be composed of qualified staff with skill and experience necessary to undertake the range of task set out in these Terms of Reference which shall be supported by adequate technical and other staff. They should have obtained appropriate educational degree, attended relevant trainings and acquired appropriate years of experience in detailed engineering design and procurement assistance of roads, related road works, and other infrastructures and in their respective fields of expertise. Presented in the job description/ responsibilities and preferably required qualifications of the key staff.

The staffs must be able to express themselves in English. Foreign key staff should be eligible to practice the profession in the Philippines. In any case, replacement of staff must have qualifications that equal or exceed those of the staff originally evaluated for the position. The qualifications of the key staff are shown below.

Table 1. Key Staff Responsibilities and Qualifications

POSITION	JOB DESCRIPTION/ RESPONSIBILITIES	No. of Months	PREFERRED QUALIFICATIONS
1. Project Manager	▪ Overall guidance, direction, supervision and coordination of all members of the Project Team and overall management of the consultancy services to be rendered by the Consultant ▪ Lead, coordinate and supervise the conduct of Investigation of existing conditions in the identified projects and collection/evaluation of data/information necessary for the detailed design services required in the TOR ▪ Lead, coordinate and supervise the required services for procurement activities ▪ Assure the dissemination of right and updated information about the project and other matters that the	10.0	▪ Registered Civil Engineer with experience as Civil Engineer or equivalent or higher capacity in the detailed engineering design of 3 bridge projects ▪ Experience of 10 years in consultancy services of any bridge infrastructure projects

POSITION	JOB DESCRIPTION/ RESPONSIBILITIES	No. of Months	PREFERRED QUALIFICATIONS
	public and other concerned should know Perform other duties and responsibilities that will be required by the Employer		
2. Sr. Bridge / Structural Engineer	▪ Investigation of existing bridge conditions in the project areas and collection and evaluation of data and information necessary for the design of bridge ▪ Conduct of detailed design of bridges and related structures in the project areas ▪ Discussion and coordination with and assistance to concerned engineers relative to the design requirements ▪ Perform other duties and responsibilities that will be required by the Employer	9.0	▪ Registered Civil Engineer with experience as Bridge/Structural Engineer or equivalent or higher capacity in the detailed engineering design of 3 bridge projects ▪ Preferably 7 years of working related experience in consultancy services
3. Traffic Engineer	▪ Plans, supervises, and coordinates all aspects of traffic engineering for the project.	2.0	▪ Registered/Licensed Civil Engineer or equivalent, with specialization in transportation planning/engineering. ▪ Extensive experience with traffic modeling, and optimal route planning. ▪ Equipped with traffic/transport modeling software. ▪ 5-year minimum work experience in the related field.
4. Geodetic Engineer	▪ Collection and evaluation of topographical data and information on the road sections ▪ Implementation and control of surveys including preparation of geodetic survey reports and drawings, including profile, plan and cross sections ▪ Discussion and coordination with and assistance to the concerned engineers relative to the design requirements ▪ Perform other duties and responsibilities that will be required by the Employer	3.0	▪ Registered Geodetic Engineer with experience as Geodetic/Locating Engineer or equivalent or higher capacity in the detailed engineering design of 1 bridge projects ▪ Preferably 5 years of working related experience in consultancy services

POSITION	JOB DESCRIPTION/ RESPONSIBILITIES	No. of Months	PREFERRED QUALIFICATIONS
5. Geologist/Seismic Specialist	▪ Collection and evaluation of geological information along the entire alignment of the road sections, specifically at locations with observed slope failures, soil erosion / scouring, tension cracks, landslide scars and areas with settlement/subsidence, as well as those in fault line areas ▪ Conduct geological survey for improvement/rehabilitation of project roads and bridges necessary for detailed engineering ▪ Discussion and coordination with and assistance to concerned engineers relative to the design requirements ▪ Perform other duties and responsibilities that will be required by the Employer	7.0	▪ Registered Geologist with experience as Geologist/Seismologist or equivalent or higher capacity in the detailed engineering design of preferably 1 bridge projects ▪ Preferably 5 years of working related experience in consultancy services
6. Geotechnical Engineer	▪ Collection and evaluation of geotechnical information on the project sites including existing studies and reports ▪ Perform necessary subsoil investigation on representative sections of the road and bridge sites with samples to be taken at suitable intervals ▪ Investigate the physical properties of materials to facilitate the design of structures ▪ Investigation of the suitability of locally available construction materials and when necessary, locate new quarries and borrow pits and assess the quality of materials and hauling distance ▪ Discussion and coordination with and assistance to concerned engineers relative to the design requirements ▪ Perform other duties and responsibilities that will be required by the Employer	6.0	▪ Registered Civil Engineer with experience as Geotechnical Engineer or equivalent or higher capacity in the detailed engineering design of 1 bridge project ▪ Preferably 5 years of working related experience in consultancy services
7. Material Engineers	▪ Conduct of Non-Destructive and Destructive Test. ▪ Examination and analysis of the test results.	7.0	▪ Licensed/Registered Civil Engineer with experience as Construction Planning / Materials Engineer or higher capacity in the detailed engineering design of

POSITION	JOB DESCRIPTION/ RESPONSIBILITIES	No. of Months	PREFERRED QUALIFICATIONS
	▪ Evaluation of the test conducted in relation to the present condition of materials and strength of the structure. ▪ Assistance in the preparation of technical specifications. ▪ Prepare a detailed analysis of all applicable methods in the restoration/retrofitting works. ▪ Perform other duties and responsibilities that will be required.		preferably 1 road and bridge project. ▪ Preferably 3 years of working experience in consultancy services.
8. Hydrologist/Hydraulic Engineer	▪ Investigation of existing conditions and collection and evaluation of hydrological and meteorological information in the project sites ▪ Preparation of hydrological survey reports and other documents ▪ Discussion with and assistance to the concerned engineers relative to the design requirements ▪ Perform other duties and responsibilities that will be required by the Employer	5.0	▪ Registered Civil Engineer with experience as Drainage Engineer/ Hydrologist or equivalent or higher capacity in the detailed engineering design of 1 bridge projects ▪ Preferably 3 years of working related experience in consultancy services
9. Quantity/Cost/ Specifications Engineer	▪ Survey and investigation of the present condition of materials supply system, availability of construction machines / equipment and accessibility to the project sites and collection of data of similar construction works in the past ▪ Examination and analysis of the rate of progress concerning manpower and equipment ▪ Preparation of construction methods for work items ▪ Preparation of construction sequence over the project duration ▪ Survey and investigation of market condition including prices of materials, depreciation/operation cost of construction machines and equipment, wages and taxes and duties ▪ Assistance in the preparation of technical specifications ▪ Establishment of pay items anticipated in the construction works	3.0	▪ Registered Civil Engineer with experience as Quantity/Cost Engineer or higher capacity in the detailed engineering design of preferably 1 bridge project ▪ Preferably 3 years of working related experience in consultancy services

POSITION	JOB DESCRIPTION/ RESPONSIBILITIES	No. of Months	PREFERRED QUALIFICATIONS
	▪ Computation of all quantities for each contract to an acceptable accuracy and prepare Bill of Quantities ▪ Prepare a detailed analysis of all applicable unit prices for each contract using current cost indices, rates, etc. ▪ Preparation of cost estimates ▪ Perform other duties and responsibilities that will be required by the Employer		
10. Professional Divers	▪ Clears the Vicinity / surroundings of the existing foundation supports. ▪ Take Measurements of existing structures under water ▪ Supply clear photographs and videos of the conducted underwater exploration. ▪ Conducts the condition assessment of structures under water to expedite the reporting and have accurate results of the structural engineer ▪ Provides assistance and safety during the conduct of various studies mentioned in this study. ▪ Provides a clear and specific description of the surrounding area of the foundation./	5.0	▪ rigorous training with a certified and reputable diving organization ▪ Must have experience in diving of sub structures of bridges ▪ Able to adapt turbulent currents or high pressure of water, ▪ Knows how to measure and study different conditions of structure of bridge under water.

B. CONTRACT PERIOD

The Consultant's contract period for undertaking the study of the said project shall not be more than **300 calendar days**, unless a Time Extension is duly approved by an authorized official.

C. STAFF SCHEDULE

The Consultant's services are of input nature, which, means that the key staff and their inputs are based on the initial assessment of the required activities and presumed work schedule of the Consultant. If the needs and the requirements based on actual situation on site, require any change, on their designation and/or time input, the Consultant will effect these changes without any additional cost to the project and within the financial ceiling agreed upon the award of contract.

The Consultant shall determine the staffing plan based on the implementation schedule.

The required key personnel and their corresponding monthly work schedule is shown below.

Table 2. Number of Staff and Staff-Months

KEY STAFF	NUMBER OF EXPERTS	MONTHS	STAFF-MONTHS
1. Project Manager	1	10.0	10.0
2. Sr. Bridge / Structural Engineer	2	9.0	18.0
3. Traffic Engineer	1	2.0	2.0
4. Geodetic Engineer	2	3.0	6.0
5. Geologist/Seismic Specialist	2	7.0	14.0
6. Geotechnical Engineer	2	6.0	12.0
7. Materials Engineer	1	7.0	7.0
8. Hydrologist/Hydraulic Engineer	1	5.0	5.0
9. Quantity/Cost/Specifications Engineer	1	3.0	3.0
10. Professional Divers	10	5.0	50.0
Sub-Total A	**23**		**127**

V. DELIVERABLES

The following table enumerates all required deliverables that the Consultant shall submit in accordance with the descriptions indicated hereunder:

Table 3. Deliverables

No.	DELIVERABLES	NO. OF SETS FOR DRAFT VERSION	SIZE	SCHEDULE OF FIRST SUBMISSION	NO. OF SETS FOR FINAL VERSION*	E-FILE FORMAT
1.0	**Design Data Collection**					
1.1	Field Survey and Investigation Report for Pier 14 and 15	1 set	A4	Within 2st Month	5 sets	PDF (scanned)
1.2	Field Survey and Investigation Report for the whole Bridge	1 set	A4	Within 4rd Month	5 sets	PDF (scanned)
2.0	**Assessment and Technical Studies**					
2.1	Structural Analysis/Assessment Reports for Pier 14 and 15	1 set	A4	Within 2nd Month	5 sets	PDF (searchable)
2.2	Underwater Diving Videos and Progress Reports for Pier 14 and 15	1 set	N/A	Within 2nd Month	1 Full Set	USB / Memory Drive
2.3	Structural Analysis/Assessment Reports For Whole Bridge	1 set	A4	Within 7th Month	5 sets	PDF (searchable)
2.4	Underwater Diving Videos and Progress Reports for the whole bridge	1 set	N/A	Within 3rd Month	1 Full Set	USB / Memory Drive

No.	DELIVERABLES	NO. OF SETS FOR DRAFT VERSION	SIZE	SCHEDULE OF FIRST SUBMISSION	NO. OF SETS FOR FINAL VERSION*	E-FILE FORMAT
3.0	**Detailed Engineering Design**					
3.1	DED Plan (original Mylar plans, signed and sealed) for Pier 14 and 15	2 sets	A2	Within 3rd Month	1 set (Mylar)	DWG Files / RVT Files
3.2	DED Plan (original Mylar plans, signed and sealed) for whole bridge	2 sets	A2	Within 9th Month	1 set (Mylar)	DWG Files / RVT Files
3.3	Hydrologic/Hydraulic/Hydrodynamic Geotechnical and Structural Assessments and Analysis Report for Pier 14 and 15	1 set	A4	Within 1st Month	5 sets	PDF (searchable)
3.4	Hydrologic/Hydraulic/Hydrodynamic, Geotechnical and Structural Assessments and Analysis Report for whole bridge	1 set	A4	Within 4rd Month	5 sets	PDF (searchable)
3.3	Construction Methodology for Pier 14 and 15	1 set	A4	Within 2nd Month	5 sets	PDF (searchable)
3.3	Construction Methodology for whole bridge	1 set	A4	Within 8th Month	5 sets	PDF (searchable)
3.4	Comprehensive Repair and Maintenance Manual for whole bridge	1 set	A4	Within 9th Month	5 sets	PDF (searchable)
4.0	**Contract Documents**					
4.1	Quantity Calculations Report for Pier 14 and 15	1 set	A4	Within 2nd Month	5 sets	XLS / XLSX Files
4.2	Technical Specifications for Pier 14 and 15	1 set	A4	Within 2nd Month	5 sets	PDF (searchable)
4.3	Cost Estimates (Detailed Unit Price Analysis (DUPA) and Program of Works	1 set	A4	Within 3rd Month	5 sets	XLS / XLSX Files

No.	DELIVERABLES	NO. OF SETS FOR DRAFT VERSION	SIZE	SCHEDULE OF FIRST SUBMISSION	NO. OF SETS FOR FINAL VERSION*	E-FILE FORMAT
4.4	Bidding Plans (reproduced copies of the Approved DED Plan) for Pier 14 and 15	1 set	A2	Within 2nd Month	5 sets	PDF (scanned)
4.5	Indicative Construction Schedule for Pier 14 and 15	1 set	A4	Within 2nd Month	5 sets	PDF (searchable)
4.6	Quantity Calculations Report for the Whole Bridge	1 set	A4	Within 9th Month	5 sets	XLS / XLSX Files
4.7	Technical Specifications for the Whole Bridge	1 set	A4	Within 8th Month	5 sets	PDF (searchable)
4.8	Cost Estimates (Detailed Unit Price Analysis (DUPA) and Program of Works (POW)	1 set	A4	Within 9th Month	5 sets	XLS / XLSX Files
4.9	Bidding Plans (reproduced copies of the Approved DED Plan) for the Whole Bridge	1 set	A2	Within 9th Month	5 sets	PDF (scanned)
4.10	Indicative Construction Schedule for the whole bridge	1 set	A4	Within 8th Month	5 sets	PDF (searchable)
5.0	**Technology Transfer**					
5.1	Technology Transfer Documentation Report	1 set	A4	Within 10th Month	2 sets	PDF
5.2	Technology Transfer Laptops with Licensed Design and Analysis Software	2 sets	N/A	Until Contract End	2 sets	New Condition

No.	DELIVERABLES	NO. OF SETS FOR DRAFT VERSION	SIZE	SCHEDULE OF FIRST SUBMISSION	NO. OF SETS FOR FINAL VERSION*	E-FILE FORMAT
5.3	Comprehensive training for the Repair and Maintenance Manual for whole bridge	1 set	N/A	Within 10th Month	N/A	N/A
6.0	**Other Requirements**					
6.1	Inception Report	1 set	A4	Within 1st Month	2 sets	PDF
6.2	Monthly Progress Reports	N/A	N/A	Every month	2 sets	PDF
6.3	Completion Report	N/A	N/A	Until Contract End	2 sets	PDF

Notes:

i. *Draft version - deliverables subject for initial/further review of DPWH*

ii. *Final version – refer to the version of the deliverables found in order by DPWH which shall be reproduced into a number of copies of approved plans/reports specified above; deliverables not needing review*

iii. *Draft versions of deliverables shall be resubmitted within two (2) weeks after the receipt of comments from DPWH.*

iv. *Final versions of deliverables shall be submitted within one (1) week after DPWH receiving approval from DPWH.*

v. *All plans and reports are to be printed on a high-quality white paper or Mylar sheets (for final plans), unless otherwise noted.*

vi. *All plans and reports shall be legibly labelled on the spine, if spine widths permit.*

vii. *After completion of the services, all electronic files of field survey data, reports, plans and drawings, and other outputs and relevant data shall be turned-over by the Consultant to DPWH, in an appropriate editable format stored in a USB flash drive.*

viii. *All signatures and dry seals affixed onto the original documents shall be clear and legible in the electronic files.*

5.1 INCEPTION REPORT **(3 sets)** to be submitted to the implementing office within one (1) month after the commencement of the consulting services. It shall outline a detailed work program for the undertakings and briefly describe the methodologies and project schedule of activities (GANTT and S-Curve) proposed to meet the terms of reference. The report shall include the initial findings as well as preliminary layout of the forms to be used for various investigations and calculations. Inception Report shall be submitted in soft-bound copy with title of the report written at the spine.

5.2 PROGRESS REPORT **(8 sets)** to be submitted to the implementing office every month thereafter starting not later than the 15th day after the end of the second month following the submission of the Inception Report. The report shall include status report, physical and financial as well as developments, issues, and findings as of report period.

5.3 Deliverables for Pier 14 and Pier 15 shall be prioritized since it has the most critical condition that needs to be addressed based on the preliminary report of San Juanico Bridge. Reports for the said Piers shall be submitted to Implementing Office within three (3) months of the effectivity of the contract.

5.3 DRAFT FINAL REPORT **(3 sets)** shall be submitted to the implementing office within 9th months from the commencement of the Consultant's services giving details of the Consultant's findings and recommendations based on the scope of work outlined in the terms of reference. The report shall include all relevant information, which supports the conclusions in sufficient detail to enable the calculations to be verified and allow re-calculation with modification of the key assumption without the need for supplementary data.

5.4 All Draft Final outputs shall be submitted a month before the allotted schedule to complete prior to the contact expiration and be subjected to review and evaluation of the Implementing Office, BOD, OCD and other relevant offices as deemed necessary.

5.5 FINAL REPORT **(5 copies)** to be submitted within thirty (30) days of receipt from Government of comments on the draft final report incorporating all appropriate revisions and clarifications. Final Report shall be submitted in soft-bound copy with title of the report written at the spine.

5.6 EXECUTIVE SUMMARY **(5 copies)** to be submitted together with the Final Report. It shall contain a brief statement of the project covered in the final report, background information, and results of the analysis, conclusion and recommendation/s. The Executive Summary shall be submitted in soft-bound copy with the title of the report written at the spine.

5.7 Reports in appropriate electronic file format (i.e. Microsoft Office, Adobe PDF, AutoCAD, transport model input and output files, etc.) of the draft and final report containing inceptions, all reports, technical assessments, drawing, key data, etc., systematically organized in traceable and auditable formats shall be

prepared in DVD and/or CD disk, five (5) copies each. Shape files of the missing gap projects shall be submitted along with the Final Report. In addition, PowerPoint presentation for the project shall be included in the submitted e-copy of the Report.

VI. LOGISTICS

The following logistics are necessary for the conduct of the study:

- Project Office
- Office Furniture, Equipment and Supplies;
- Communication Facilities
- Non-Destructive Testing and Destructive Testing Equipment
- Geotechnical Exploration Equipment
- Survey Equipment
- Laptops including Software *(to be turned over to DPWH RO VIII)*
- Plotter Machine *(to be turned over to DPWH RO VIII)*
- Micro-core Drilling Set *(to be turned over to DPWH RO VIII)*
- Ultrasonic Pulse Velocity Tester *(to be turned over to DPWH RO VIII)*
- Rebar Scanner/Locator *(to be turned over to DPWH RO VIII)*
- Magnetic Digital Concrete Rebound Hammer *(to be turned over to DPWH RO VIII)*
- Service vehicles;
- Tug Boat and Rafts;
- Drone
- Metal Scaffoldings
- Diving Equipment

A. BRIDGE SOFTWARE

(Laptop and Software – to be turned over to DPWH Regional Office)

BRIDGE DESIGN & RETROFITING SOFTWARE	
1. Software License Model	• Perpetual
2. License Access Management	• Stand Alone
3. System Requirements	• Operating System: Windows 10 – 64 bit • Memory: 32GB • Processor: i9 – 12th Gen. • Video: 12GB
4. Hardware Requirements	• Application Desktop and Laptop
5. Maintenance Years Requirement	• 5 Years (Technical Support, Coaching, Problem Resolutions, Trouble Shooting). Renewable every 5 years thereafter.
6. Interoperability and Compatibility	• With any CAD Software and with other Building Structural Analysis and Design Software
7. Functionalities	
a. 2D and 3D Bridge modeling (Object-Ready and User Defined)	• Physical Modeling • Analytical Modeling • Structural Wizards • Super Structure • Sub-Structure • Foundation

b. Analysis	• Finite Element Method • Static Analysis • Dynamic Analysis • Time History Analysis • Response Spectrum Analysis • Geometric Non-linear Analysis • Push-over Analysis • P- Delta Analysis • Large Displacement Analysis • Construction Stages Analysis • Composite Bridge Analysis • Buckling Analysis • Thermal Stress Analysis • Moving Load Analysis • Rail Track Analysis • Cable Force Tuning • Cable Optimization • Interaction Curves • Capacity Check Ratio • Tendon Generator • Soil-Structure Interaction
c. Design	• Culvert (Box / Arch / Slab) • Reinforced Concrete Bridge • Curved Bridge • Skewed Bridge • Segmental Bridge • Steel Bridge • Cable Stayed Bridge • Suspension Bridge • Pre-Stressed Bridge • Bearing Pad Design • Colum Interaction Diagram Design • Pile Design (Concrete & Steel) • Expansion Joints/ Expansion Dam Design • Connections Design
d. Calculation	• Displacement • Forces and Reactions • Stresses • Steel Reinforcements • Sections and Dimensions • Safety Factors
8. Visualization	• 2D and 3D visualization • Animation • Rendering • Result Verification • Material Specifications • Clear, Systematic Arrangement of Formulas and Data Used • Design Code References Used
9. Design Codes	• AASHTO • AISC • ACI • AASHTO LRFD • ASCE • NSCP (Latest Versions) • DGCS of the DPWH

10. Output File	• PDF • Excel • Text Output / Word • PNG file
11. Miscellaneous	
a. Documentation	• Installers & Manuals (Dongle if applicable) • Product Demonstration Prior to Bidding
b. Additional Requirement	• Personal Computer Set: • Processor & Chipset: Intel i7 or higher – latest generation (8 cores 16 Threads or any equivalent) (WIFI & Bluetooth Ready) • Internal Memory: 32gb RAM – DDR 4 or DDR 5 (Upgradable) • Storage: 2TB SSD & 2TB HDD • Video Card: Nvidia Video Card RTX/GTX 2070Ti or higher – 12GB RAM • MEDIA PORTS: 14 USB Ports (Internal / External) – CD / DVD / Disk Ready • Display: 23-inch diagonal or higher full High-Definition Wide Screen LED Display (165Ghz or Higher Refresh Rate and VGI / DVI/ HDMI / USB – C Port Display Ready) • Audio: Integrated Audio Compatible with plug in headset / Bluetooth • Cooling System: Thermal Cooling System (Built-In) • Power Supply: UPS or any Compatible with 6 Sockets (with Backup Power) • Hardware Inclusions: Optical/ Wireless Mouse – Keyboard – Webcam – Monitor –Mousepad • Software Inclusions: Licensed Bridge and Building Design Software, Licensed Windows 10 pro or any equivalent or higher related Operating Systems, Licensed Microsoft Office Standard (Latest Versions) under Cloud Services Program (Perpetual License) • Warranty: 3 Years parts – 1 Year Hardware Inclusions min warranty / Services / Unit Replacement (Defective).

VII. REPORTING

1. Draft Final Report shall be presented to the Planning and Design Division of the Regional Office concerned and to the DPWH BOD Central Office-Manila, prior to the printing and submission of the report. Venue, foods, and other incidental expenses that will be incurred during the presentation shall be shouldered by the consultant in coordination with the Implementing Office.

2. During the contract period and as the need arises, coordination meetings with the Regional Office and District Engineering Office concerned must be conducted to:

   (a) Initiate agreements,
   (b) Discuss the progress of the work and preliminary output;
   (c) Make comments and suggestions on a timely basis; and
   (d) Resolve problems and issues that may be encountered.

3. Further, aside from the specified scope of works mentioned above, the Consultant may propose additional works to enhance the study. The scope of any additional proposed works by the Consultant shall be established within the first two (2) months of the study, subject to the approval of the Implementing Office.

VIII. DUTIES AND RESPONSIBILITIES OF THE DPWH

A. DATA AND ASSISTANCE TO BE PROVIDED BY THE DPWH

1. To facilitate the smooth and effective implementation of the services, DPWH shall provide access to data, information and available documents relevant to the project.

2. In connection with the tasks of the Consultant that require inputs from other government agencies, the Implementing Office shall assist in liaising with other agencies.

3. The Implementing Office shall assist in securing necessary permits and clearances from other agencies.

B. DESIGN REVIEW

1. The plans to be approved by the Regional Director will be subjected for review by the Planning and Design Division in accordance to Department Order (D.O.) No. 55, series of 2020, Revised Guidelines in the Preparation of Conceptual Design, Detailed Engineering Design, "As-staked", Revised and "As-Built" Plans for Highway, Bridge and Water Projects.

2. The final plans prepared and approved, however, shall be the responsibility of the design Consultant in accordance with Section 5 of Annex "A" of The 2016 Revised Implementing Rules and Regulations of R.A. 9184, which states that the approval by the authorized government officials of detailed engineering surveys and designs undertaken by Consultants neither diminishes the responsibility of the latter for the technical integrity of the surveys and designs nor transfer any part of that responsibility to the approving officials.

IX. SPECIAL CONDITION OF THE CONTRACT

Based on BOD Reference No. 014105, report shows a weak concrete compressive strength and water leakage is commonly seen on carbon fibers of the deck slab on the bridge. Pier 14 and 15 specifically shows a more critical condition showing a scour / dilapidation of foundation which is considered out of safety standards, hence both should be given utmost priority in the rehabilitation and retrofitting of the bridge.

In this regard, submission of reports, plans and analyses for pier 14 and 15 shall be submitted within three (3) months.

X. PAYMENT SCHEME

A. Advance Payment

1. Upon request, the Consultant shall be paid an Advance Payment equivalent to fifteen percent (15%) of the Contract Amount, subject to the requirements per Department Order 21, s.2021 *"Amendment to Department Order No. 24, s.2019 to Include Output-Based Contracts".*

2. The Advance Payment shall be made only upon the submission by the Consultant to and acceptance by the implementing office/procuring entity of an irrevocable standby letter of credit issued by an entity acceptable to the agency and an amount equal to the advance payment, in accordance with the 2016 Revised IRR Section 42.3 of R.A. 9184 where contract implementation guidelines for the procurement of consulting services are provided in Annex "F".

3. The advance payment shall be repaid by the Consultant by deducting from his progress payments such sum which is equivalent to 15% of every progress billing and shall be fully recoup during final billing.

B. Progress Billing

1. The Consultant shall submit to the Implementing Office a Progress Billing based on the completed report **per Item of Work, reviewed and accepted** by the end-user.

C. Final Billing

1. The Consultant shall submit to the Implementing Office, a request for Final Billing based on the Final Report submitted, incorporating the comments and recommendations during the presentation of the study, reviewed and accepted by the Department of Public Works and Highways Regional Office VIII.

2. The Consultant shall turn-over to the Implementing Office all returnable equipments, computers, softwares, and purchased office supplies, etc., included in the reimbursable items.

D. Retention Payment

1. No retention payment shall be withheld.

E. Liquidated Damages

1. Where the Consulting Firm refuses or fails to satisfactorily complete the work within the specified contract time, plus any time extension duly granted and is hereby in default under the contract, the Consulting Firm shall pay for liquidated damages, and not by way of penalty, an amount, as provided in the conditions of contract, equal to at least one tenth (1/10) of one (1) percent of the cost of the unperformed portion of the works for every day of delay. Once the cumulative amount of liquidated damages reaches ten percent (10%) of the amount of the contract, the Procuring Entity may rescind or terminate the contract, without prejudice to other courses of action and remedies available under the circumstances.

2. To be entitled to such liquidated damages, the Implementing Office does not have to prove that it has incurred actual damages. Such amount shall be deducted from any money due or which may become due the Consulting Firm under the contract and/or collect such liquidated damages from the contract amount or other securities posted by the Consulting Firm whichever is convenient to DPWH.

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Submitted by:

MA. ROWENA P. PURIFICACION
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APPROVED:

AGNES M. BARONDA
BAC Chairperson

NOTED:

EDGAR B. TABACON, CESO IV
Regional Director

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