Technical Specification

Items	Specification	Statement of Compliance
		Bidders must state here either "Pass" or "Fail" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Pass" or "Fail" must be supported by evidence in a Bidders Bid and cross referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.
	Procurement of Design and Construction of Two-Storey Reinforced Concrete Multipurpose Building	
I	**GENERAL CONDITION**	
A.	**GENERAL CODE AND STANDARDS** The applicable rules and regulations prescribed by the following agencies and /or embodied in the following shall be observed:	

	Department of Public Works and Highways Department of Health Bureau of Fire Protection Applicable Building Laws in the Municipality of Norzagaray.	
B.	**GENERAL CONDITIONS OF PLANS AND SPECIFICATIONS** The execution of the Specification, Plans and other related Contract documents shall be subjected to the rules and regulations as provided in the General Conditions of the Contract. The Plans and Specifications shall be interpreted by the Procuring Entity and or his/her representative. The Contractor is enjoined to confer with the Procuring Entity and or his/her representative. The Contractor is enjoined to confer with the Procuring Entity on items for clarification before submitting his/her bid. No excuses shall be entertained for misinterpretation of the Plans and Specifications after the award of contract. All work as deemed required by the Procuring Entity shall be carried out properly by the Contractor. a) The Contractor shall consult the Procuring Entity on portion of the work not mentioned in the Specification and not illustrated on the Plans. He shall not work without proper instruction or detailed plans approved by the Procuring Entity, otherwise he shall be responsible for the acceptance of the work done without details. In such case, the Contractor shall make good the work at his own expense. b) No alteration or addition shall be allowed without the consent and proper documentation approved by the Procuring Entity, even such change is ordered by the Procuring Entity, the Contractor shall bring the case to the Procuring Entity, Request for approval of such changes, alteration, deviation of work shall not be done without consent of the Procuring Entity. Changes may be presented to the Procuring Entity in the form of shop drawings. Two (2) set of clean plans and specifications shall always be kept at the jobsite to be available to the Procuring Entity or their representative upon his request during the construction.	
C.	**SCOPE OF WORK - CONSTRUCTION WORK** Building proposed for construction shall comply with all the regulations and specification herein set forth governing quality, characteristics and properties of materials, methods of construction and classification. All other matters relative to the design and construction of the	

	building and structures not provided for in these specifications shall conform to the provisions of the Fire Code of the Philippines and National Structure Code of the Philippines, as adopted and promulgated by the Board of Civil Engineering pursuant to Republic Act Number 544, as amended, otherwise known as the "Civil Engineering Law". The Contractor shall supply all the materials, provide equipment and perform the construction activities but not limited of the following: a. Mobilization/Demobilization The Contractor shall mobilize and bring out into work, all personnel, temporary facilities and equipment, in accordance with the approved construction program, equipment moving and utilization schedule and manpower schedule, from its regular place of business to the site to undertake the contract. Mobilization shall include the obtaining and transporting to jobsite of equipment, materials, tools personnel, temporary facilities and all necessary items for the execution and completion of the work and shall also include the setting up and the verification of all equipment, instrument and all other facility until it is rendered operable. Demobilization shall include dismantlement and removal from the site of Contractor's temporary facilities, materials and equipment. Demobilization shall also include clean-up of the site after completion of the contract as approved by Engineers and transportation from the site of Contractor's personnel.	
D.	**OCCUPANCY PERMITS AND INSURANCE**	
	Contractor shall be responsible to All Risk Insurance & Third-Party Liability and Workman's Compensation Insurance (CARI), and other insurances required by the Local Government Unit (LGU) as may be required. The Contractor shall be responsible for securing Occupancy Permit after completion of the construction.	
E.	**SCOPE OF WORK**	
	A. The Contractor shall conduct thorough inspection of the existing job site conditions. B. The Contractor shall construct all Civil Works, Structural, Architectural, Electrical, and Sanitary/ Plumbing in accordance with the Plans and Specifications. All items shown on the Plans but not mentioned in the Specifications shall be	

	included. Discrepancies shall be verified with the Procuring Entity. C. The Contractor shall consult the NorWD Technical Personnel to locate benchmarks. Shop drawings of stake out plan and actual reference marks shall be verified and approved by the Procuring Entity prior to any permanent construction. He shall refer to the General Nature and Scope of Work and other Bid Documents for more extensive description of the work. D. Final Cleaning, Re-touch and Certificate of Occupancy as Pre-requisite to Final Acceptance: Final cleaning and re-touch shall be done by Contractor for approval by the Procuring Entity/Project In-charged. The Contractor shall be responsible to secure a Certificate of Occupancy from the Municipal Engineer's Office after completion of the construction of the completed project as pre-requisite to Final Acceptance of the owner. E. The Contractor shall be responsible for the safety and safe working practices of its respective employees and laborers. F. The Procuring Entity may at any time without invalidating the Contract make changes by altering, adding to or deducting from the work as covered by the drawings, specifications, and general scope in written instructions. Provisions under General Conditions of the contract cover such circumstances.	
II	**GENERAL REQUIREMENTS**	
A.	**SITE WORK**	
a.	**Earthworks:** 1. Excavation. Footings and Foundations Subject to the provisions of Articles 684 to 686 of the Civil Code of the Philippines on lateral and subjacent support, the design and quality of materials used structurally in excavation, footings and in foundations shall conform to accepted engineering practices. Footings and foundations shall be of the appropriate type, of adequate size, and capacity in order to safely sustain the superimposed loads under seismic/wind or any condition of external forces that may affect the stability of the structure. The Contractor shall employ construction methodology that is minimal impact to its immediate environs during foundations works. Such methodology shall be approved by NorWD before commencing any foundation works. 2. Excavation and Fill	

	Excavation or fills for buildings or structures shall be constructed or protected that they do not endanger life or property. Whenever the depth of excavation for any construction is such that the lateral and subjacent support of the adjoining property or existing structure thereon would be affected in a manner that the stability or safety of the same is endangered, the Contractor undertaking or causing the excavation to be undertaken shall be responsible for the expense of underpinning or extending the foundation or footings of the aforementioned property or structure. 3. Site Clearing General site clearing operations include removal of demolished materials and objectionable matter, and clearing to allow for new construction. Provide barricades, coverings or other types of protection necessary to prevent damage and accident.	
B.	**SITE SAFETY REQUIREMENTS**	
	The Contractor shall, maintain a temporary board – up, security for the proper execution of site up-keeping. Such board-up shall be built where necessary and required by NorWD for its full length except for such openings as may be necessary for the proper execution of the work, in such case, openings shall be provided with doors which shall be kept closed at all times except in actual use.	
C.	**TEMPORARY SITE FACILITIES**	
	1. Temporary Facilities: The Contractor shall provide a construction site facility. 2. Other Temporary Provisions: • The General Contractor shall provide all temporary: • The Contractor shall provide all temporary lighting, power, water supply and all necessary facilities sufficient enough for the simultaneous use of all possible fields of work to complete the project. • The Contractor shall provide the necessary number of warehousemen to ensure security of construction site. • The Contractor shall provide Billboards for precautions for Public Safety. • Other provisions as required by the National Building Code. • All others required as discussed in the Pre-Bid Conference or per issued Supplemental Bid Bulletin. • The Contractor shall provide the necessary number of units of Fire extinguishers.	

D.	**STORAGE AND FILING OF MATERIALS**	
	1. Delivery: General Contractor shall ensure that materials are properly turned over and delivered on site in good quality and condition. 2. Storage: Contractor shall designate and/or allot a space for storage of their materials and for erection of their sheds and tool houses. Materials shall be arranged properly and accordingly in terms of sizes, quality, quantity, category and time of use. 3. Warehouse shall be maintained and secured properly by the designated person of the Contractor. 4. All cement, lime and other materials affected by moisture shall be stored on platforms and protected from weather. Materials shall be stored as to insure the preservation of their quality and fitness for their work. Stored materials shall be located so as to facilitate prompt inspection.	
III	**CONCRETING WORKS**	
	This item shall consist of furnishing, placing of structure concrete with reinforcement of footing, columns, tie beams, beams suspended slab, slab on fill, formworks 12mm thick plywood, form lumber, coco lumber, scaffolding, and assorted nails or better-quality materials. Concrete shall consist of a mixture of Portland cement, fine aggregate, coarse aggregate, and water. **Material Requirements:** 1. All cement shall be Portland type. 2. Fine aggregates used in the composition of concrete shall consist of washed river sand. 3. Coarse aggregate shall consist of stone, gravel or other approved inert materials with similar characteristics. Size shall be ¾" crushed gravel. 4. The water to be used in the project for the concrete works shall be reasonably clean and free from oil, salt, acid, alkaline, grass or other substance injurious to the finish product. 5. The concrete materials shall be proportioned in accordance with the requirements for the class of concrete which produce 3,000 psi min. compressive strength. 6. Quality Control Testing: The Contractor shall perform all sampling, testing and inspection necessary to assure quality control of the component materials and the concrete. The Contractor shall be responsible for determining the gradation of fine and coarse aggregates and for testing the concrete mixture for slump, air content, water-cement ration and temperature. He shall	

conduct his operations so as to produce a mix conforming to the approved mix design.

7. Documentation

The contractor shall maintain adequate records of all inspections and tests. The records shall indicate the nature and number of observations made, the number and type of deficiencies found, the quantities approved and rejected, and nature of any corrective action taken.

The Engineer may take independent assurance samples at random location for acceptance purposes as he deems necessary.

8. Formwork Stripping Time (When Ordinary Portland Cement is uses)

Type of Formwork	Formwork Removal Time
Sides of Walls, Columns and Vertical Faces of Beam	24 hours to 48 hours (As per engineers' decision)
Slabs (Props left under)	3 days
Beam Soffits (Props left under)	7 days

Removal of Props of Slabs:	
Slabs spanning up to 4.5m	14 days
Slabs spanning over 4.5m	14 days

Removal of Props of Beams and Arches:	
Span up to 6m	14 days
Slabs over 6m	21 days

A. **CONCEPTUAL DESIGN CRITERIA AND PARAMETERS FOR STRUCTURAL DESIGN AND ANALYSIS:**

1. Codes And References

a. American Concrete Institute (ACI) Standards
ACI 318 - Building code requirements for reinforced concrete structures
ACI 315 - Manual of standard practice for details and detailing of concrete reinforcement

ACI 350 - Environmental Engineering Concrete Structures

b. Structural Design Manual Specification
c. National Structural Code of the Philippines (NSCP)
d. Philippine National Standards (PNS)
e. American Society of Testing and Materials (ASTM)
f. Uniform Building Code (UBC)
g. Steel Construction Manual (AISC)
h. Portland Cement Association (PCA) Concrete Information
i. BP 344 or Accessibility Law and its Latest and Amended IRR
j. Bureau of Product Standards (BPS)
k. DPWH Blue Book
l. Existing Local Codes and Ordinances

2. Design Load

a. Dead Load (DL)

Concrete	24 KN /m3 (150 pcf)
Steel	78 KN/m3 (490 pcf)
Water	9.81 KN/m3 (62.4 pcf)

Note: Additional Roof Dead load for Installation of Solar Panels.

b. Live Load (LL)

Floor Live load	4.80 KN/m²
Stair Live load	4.80 KN/m²
Roof with Slope 2 to 1 or less	1.44 KN/m^2

c. Wind Load (WL)

Wind load shall be considered in the design in accordance with NSCP. Wind shall be assumed to come from any horizontal direction. No reduction in wind pressure shall be taken for the shielding effect of adjacent structures.

where: $P = c_e\, c_q\, q_s\, I$

P = design wind pressure, kPa

For areas located along the typhoon belt: P = 275 kph (minimum)

c_e = combined height, exposure and gust factor coefficient

c_q = pressure coefficient for the structure or portion of structure under consideration
q_s = wind stagnation pressure at a height of 10 meters
I = importance factor as set forth by occupancy category

d. Earthquake Load (EL)

Design base shear (in accordance with NSCP)

Where: $V = \frac{ZIC}{R_w} x W$

Z = Seismic zone factor
I = Importance factor based on global ductility capacity of lateral force-resisting frame
W= the total seismic dead load
C= numerical coefficient as determined from the formula

$C = \frac{1.25s}{t^{2/3}} < 2.75$

s = site coefficient for the given soil characteristics
t = fundamental period of vibration, in seconds, of the structure for the direction under consideration, $c_t(hn)^{3/4}$
ct = 0.050 (for all buildings as set forth by NSCP)
h_n = Height above the base to level n in meters

3. Minimum Material Strength

a. Concrete,

fc′ 21 MPa (3,000 psi) or as specified

Minimum 28-day compressive cylinder strength for structural elements, including slabs on grade and stairs.

b. Reinforced Steel, fy

for 12mm and smaller	276 MPa (40,000 psi)
for 16mm and larger	414 MPa (60,000 psi)

c. Steel and Miscellaneous Metal Works

Structural shapes, fy (open or non-tubular) ASTM A36	248.2 MPa (36,000 psi)
Shop and field welding, fy shall be in accordance with AWS A5.1 or a 5.5 (E70xx Series)	485 MPa (70,000 psi)
Anchor bolts shall, ft conform to ASTM A 307	138 MPa (20,000 psi)
Tension rods shall, fy be structural steel conforming to ASTM A 40	276 MPa (40,000 psi)

4. Allowable Stresses in Concrete

a) Flexure, fc

Extreme fiber stress in compression	0.45 fc'
Extreme fiber stress in tension	1.6 $(fc')^{1/2}$

b) Shear, ν

As a measure of diagonal tension at a distance d from the face of support

Beams with no web reinforcement	1.1 $(fc')^{1/2}$
Joists with no web reinforcement	1.2 $(fc')^{1/2}$
Members with web reinforcement	5 $(fc')^{1/2}$
Slab and Footings	2 $(fc')^{1/2}$
On full area	0.25 $(fc')^{1/2}$
On one-third area or less	0.375 $(fc')^{1/2}$

c) Beam

16 mm ø bars and smaller	40 mm (1 ½")
20 mm ø bars and higher	50 mm (2")

d) Columns and Pedestal

Exposed to Earth, Water, Sewage or Weather

Stirrups & Ties	75 mm (3")
Principal Reinforcement	75 mm (3")

e) Columns and Pedestal

Formed concrete surfaces exposed to earth, water, sewage, weather or in contact with ground	50 mm (2")
At formed surfaces and bottoms bearing on concrete work mat	50 mm (2")
At unformed surfaces and bottoms in contact with earth	75 mm (3")

IV.	**MASONRY WORKS**	
	1. For walls and partitions requiring concrete hollow blocks (CHBs), locally-made available CHBs with minimum compressive strength of 4.80 MPa	

	may be used. Initial blocks must be adequately anchored to the concrete wall column or slab thoroughly. It shall be set in full mortar; all cells of units with rebars shall be filled solidly with concrete grout. 2. Cement mortar shall be mixed only to such quantity as required for immediate use and any mixture which develops initial set shall not be used. Mixing of cement mortar which has practically hardened shall not be used.	
V.	**ROOFING WORKS**	
	1. The roof shall be covered with minimum 0.5 mm pre-painted G.I. Long Span Rib-type roofing. The roofing shall be secured to the purlins with min. 2 1/2" max. 3" long Tek screws. Ridge rolls, hip rolls and valleys to be used shall be those compatible with the 0.5 mm pre-painted G. I. Long Span Rib-type roofing sheets. They shall lap the roofing sheets at least 250mm. The ridge rolls, hip rolls and valleys shall be riveted to the roofing sheets. 2. The roof shall be covered with 6mm thick Rib-type polycarbonate sheets. The roofing shall be secured to the purlins with min. 2 1/2" max. 3" long Tek screws. Ridge rolls, hip rolls and valleys to be used shall be those compatible with the 6mm thick solid polycarbonate sheets. They shall lap the roofing sheets at least 250mm. The ridge rolls, hip rolls and valleys shall be riveted to the roofing sheets.	
VI.	**DOORS, WINDOWS, AND STAIRCASE**	
	A. DOORS a. Main Doors (D1): Swing glass doors with aluminum frames; Use ¼" Thick Tempered Glass. Including complete accessories. b. Secondary Doors (D2): Steel Panel Doors with complete accessories c. Comfort Room Doors (D4): Aluminum Doors with complete accessories. d. Motorized Roll-Up Door Installation of supplied doors shall be in the following areas: a. Warehouse Office b. Comfort Rooms c. Fire Exits d. Main Door e. Balcony Exit/Entrance f. Vehicle Service Entrance B. WINDOWS	

	a. Slinding Windows b. Fixed Windows C. STAIR a. Width: At Least 1.50 Meters b. Hand Rails: Stainless Steel	
VII	FINISHES, CEILING, TILE AND PAINTING WORKS	
	Refer to Plans for location. Verify plans for other finishes not specified or omitted herein. Sample of all materials shall be submitted to the Procuring Entity for approval as to color and quality workmanship. As per detailed design of the contractor.	
A.	**FLOOR FINISHES**	
	1. Granite Tiles: 60cm x 60cm. For 2nd Floor as to where to be applied. 2. Vitrified Glazed & Unglazed Tiles: 40cm x 40cm (For the Comfort Rooms Floors and Walls) 3. Ceramic Tiles: 150cm x 25cm. Anti-Slip. For the Stairs and Balcony. 4. Rough Finish – Ground Floor Note: Submit catalogue & mock-up for Procuring Entity's approval.	
B.	**WALL FINISHES**	
	Plain Cement Plaster Finish: 10 mm. thick. On vertical, on masonry and for all concrete hollow block surfaces, painted finish as indicated in the Drawings and for all areas not otherwise noted with other finishes. Note: Submit catalogue & mock-up for Procuring Entity's approval.	
C.	**CEILING FINISHES**	
	Supply and installation of Cove Type Ceiling for 2nd Floor, design may vary as per Contractor detailed design. Note: Submit catalogue & mock-up for Procuring Entity's approval.	
D.	**PAINTING WORKS**	
	1. Exterior Wall Finish Textured Semi-Gloss Latex Paint Finish on Cement Plaster or as approved. 2. Interior Wall Finish Semi-gloss latex or as approved. 3. Cladding Exterior Wall Cladding as per architect approval. Note: All painting materials shall be of the best quality. Submit catalogue & mock-up for Procuring Entity's approval.	
VIII	**METAL WORKS**	

	A. All steel reinforcing bars shall be deformed conforming to ASTM A615-68. Minimum yield strength of reinforcing bars shall be as follows: 1. Fy = 60 ksi (414 MPa) For concrete structural frames of buildings 2. Fy = 33 ksi (228 MPa) For slabs-on-fill, manholes and sanitary structures 3. Fy = 36 ksi (250 MPa) For H-Shaped Channel and Angular B. Balcony Railings Use Aluminum Type with minimum 6 mm thk Glass C. For Roofing and Trusses D. Signage – Stainless Lettering of Norzagaray Water District's Name and Logo Note: Submit catalogue & mock-up for Procuring Entity's approval.	
IX.	**PARTITIONS**	
	A. TOILET CUBICLES a. Partition System: homogeneous, floor-anchored, high pressure compact or Aluminum partition and doors complete with Aluminum bracing and hinges, brass or molded plastic pedestals, and indicator lock with heavy duty Aluminum hardware. Submit catalogue & mock-up for Procuring Entity's approval. b. Accessories: All accessories should be in molded plastic material. Submit samples for Procuring Entity Approval. 1. Urinal Dividers: wall-hung suspended type with Aluminum stiffener and Aluminum wall bracket; material same as toilet partition system Note: Submit catalogue & mock-up for Procuring Entity's approval.	
X.	**PLUMBING WORKS AND SANITARY WORKS**	
	All fixtures shall be installed complete with accessories, such as fittings, angle valve, shut-off valve and supply pipe assembly, p-traps flange and others to make it functional. Submit model and color samples for Procuring Entity's approval of all fixtures and accessories. 1. Water closet: with flush tanks. 2. Urinal: Wall-hung type. 3. Lavatory: Under the counter type lavatory with single faucet hole on center w/ front overflow hole, to match water closet color.	

	4. Floor Drains: Stainless steel	
A.	**SCOPE OF WORKS**	
	The work to be undertaken under this section shall consist of the furnishing of all materials, labor tools, equipment and other facilities and the satisfactory performance of all work necessary for the complete installation, testing and operation of the plumbing system accordance with the applicable drawing and this section of that specifications consisting of, but not necessarily limited to the following: a. Building's Water distribution system. b. Furnishing, installation and testing of water closets, lavatories, accessories including controls and piping works. c. Furnishing and installation of all plumbing fixtures, fittings, trims and accessories. d. All work shall be performed in accordance with the requirements of all applicable laws of the Republic of the Philippines and all local codes and ordinances. The contractor is required to refer to all mechanical, electrical, structural and architectural plans and specifications all shall investigate all possible interference and conditions affecting his work in this section and that of the other sections. All plumbing works to be done and sizes of pipe to be used shall be of the sizes, which are required and in accordance with the NATIONAL PLUMBING CODE OF THE PHILIPPINES.	
B.	**GENERAL**	
	A. DRAWING AND SPECIFICATIONS: a. The contract drawings and the specifications are complimentary to each other, and any labor or materials called for by both, if necessary for the successful operation of any other particular types of equipment shall be furnished and installed without additional cost of Procuring Entity. b. All dimensional locations of fixtures, equipment, floors and roof drains risers and pipe. Chases shall be verified on the architectural drawings and manufacturer's catalogs. c. Upon completion of the work as described herein, the Contractor shall at his own expense furnish the Procuring Entity originals and Five (5) sets of "AS BUILT" Plans for future reference and maintenance purposes. B. PROTECTION:	

	The contractor shall protect all his work and materials loss, injury or defacement. Protection of fixtures and materials shall be provided by boards, papers and/or cloth as required and any loss, damaged or deface material shall be replaced by the Contractor at his own expense. C. INSTALLATION AND WORKMANSHIP: a. All labor shall be performed in a first-class, neat and workman like manner by mechanic skilled in their work shall be satisfactory to the Procuring Entity. b. No piping in any location shall be closed up, furred in or covered before testing and the examination of same by the inspector, Procuring Entity.	
C.	**IDENTIFICATION OF MATERIALS**	
	a. Each length of pipe, fitting, traps, fixtures, and device used in the plumbing system shall have cast, stamped or indelibly marked on it the manufacturer's trade mark or name, the weight, the type, and classes of product when so required by the standards mention above. b. All plumbing fixtures and fittings installed without the above trademarks shall be removed and replaced with probably marked fixtures and fittings without any extra cost to the NorWD. c. All plumbing pipes shall be PPR Pipe (Polypropylene Random Copolymer Plastic) with covered.	
D.	**WATER SUPPLY**	
	a. Pipes and fittings for waterline shall be as SPECIFIED BY NorWD. b. Valves-All valves, unless otherwise specified shall be gate valves of size as indicated in the drawings: for hot water supply, valves and fittings shall be insulated of a thickness equal to that of the insulation on the adjoining pipe, securely fastened in place.	
E.	**SANITARY DRAINAGE**	
	a. Soil and waste Pipes and Fittings: Soil and waste pipes and fittings shall be PVC pipes (POLYVINYL CHLORIDE) series 1000. b. Vent Pipes and Fittings: Vent pipes and fittings shall be PVC pipes. c. Floor Drains: Shower and floor drains shall be of high grade, strong, tough, and even grained metals.	
F.	**EXECUTION**	
	GENERAL INSTALLATION OF PIPES a. Install pipes approximately as shown on the drawings, as straight and direct as possible forming right angles parallel lines with walls and other pipes, and neatly spaced unless otherwise indicated. Care shall be taken not to weaken the structural portions of the building.	

	b. Maintain minimum slope of 3mm (1/8 inch fall per foot) on all soil, waste and drain lines 100mm in diameter. c. Do not install pipes or other apparatus in a manner which will interfere with full swing of the doors and windows. d. The arrangement, position and connection of pipe fixtures, drains, valves and the like indicated on the drawings shall be followed as closely as possible, the right is reserved by the Procuring Entity to change location and elevations to accommodate conditions which may arise during the progress of the work prior to installation, without additional cost to the NorWD for such changes. The responsibility for accurately laying out of the work rests with this Contractor. Should be found that any work if laid out caused interference, the matter shall be reported to the Project In-charged before connecting the work. e. Ream all screwed pipes smooth before installation. Do not bend, flatten, split or injure pipes in any way. f. Use reducing fittings, in making reduction in size of pipe. Bushing will not be allowed unless specifically approved. g. Where chrome plated piping is installed, cut and thread pipe. Bushing will not be allowed unless specifically approved. h. Carry fixture connections, concealed in building constructions, to points above floor, break out close to underside of fixture and rise exposed to fixture. i. No piping shall be installed which will provide a cross or interconnection between a distribution supply of drinking water of Domestic use and pollution or waste pipe, the water line shall be placed above the waste pipe in ground installation. **INSTALLATION OF WATER SUPPLY PIPES AND FITTINGS** a. The piping shall be extended to all fixtures, outlets and equipment. Ends of pipes and outlets shall be capped or plugged and left ready for future connections. b. Branch pipe from service line may take off of main, bottom of main, or side of main, using such cross over fittings as may be required by	

	structural or installation conditions. All service pipes, valves and fittings shall be kept at sufficient distance from other work to permit finished covering not less than12.7mm (1/2") from such other work and not less than 12.7mm between finished coverings on the different services. No water piping shall be buried in floors until after they have been inspected and approved. c. Where the branch serves more than one fixture, the branch shall be increased in size in proportion to sizes as shown on the drawings. d. Cast bronze unions shall be installed at the connection to all equipment so that they may be conveniently disassembles. e. Upon completion of water system, flush out lines and all valve sets to clear system of particles and dirt. **WATER SYSTEM TEST** a. Upon completion of the roughing-in and before fixtures, the entire water piping system shall be tested at a hydrostatic pressure of one and half (1- 1/2) times the expected working pressure in the system when in operation, and proven tight at this pressure or not less than 80 psi gauge. b. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately in a manner to that described for the entire system, and in the presence of the Procuring Entity/Project In-charged.	
XI.	**ELECTRICAL WORKS**	
A.	GENERAL DESCRIPTION	
	A. The work to be done under this work item of the Specifications consist of the fabrication, furnishing delivery and installation, complete in all details of the Electrical Work, at the subject premises and all work materials incidental to the proper completion of the installation. All work shall be done in accordance with the governing Philippine Electrical Codes and Regulations and with the Specifications, except where same shall conflict with such codes etc., which latter shall then govern. The requirements with regards to materials and workmanship specify the required standard for the furnishing of all labor, materials and appliances necessary for the complete installation of the work specified herein and indicated on the drawings.	

	B. LAWS/CODES and REGULATIONS: The work under this work item shall be executed in accordance with the latest requirements of the following: Building Code of the Philippine Electrical Codes, Laws, ordinances, and regulations of the locality having jurisdiction over the project. The requirements of the above-mentioned governing laws/codes and the requirements of the companies having involvement/participation are hereby made part of this Specifications and the CONTRACTOR is required to comply with the same. This does not relieve the CONTRACTOR from complying with requirements of specifications or drawings in excess of above laws and ordinances, codes and requirements which are not prohibited by the same. C. GUARANTEE: The CONTRACTOR shall guarantee that the electrical system is free from all grounds and defective materials and workmanship for a period of one (1) year from the date of final acceptance of the work. All defects arising within the guarantee period shall be reminded by the CONTRACTOR at his own expense. The CONTRACTOR shall indemnify and save harmless PROCURING ENTITY from and against all claims, suits, actions, or liabilities for damages arising from injuries, disabilities or loss of life to persons or damage to public or private properties resulting from fault or any act of contractor or his representative in the execution of this work. The partial acceptance of the work for the purpose of making partial payments, based on the estimated cost satisfactorily completed by the CONTRACTOR, shall not be considered as final acceptance of that portion of the work. D. DRAWINGS & SPECIFICATIONS D.1. The electrical plans, which constitute an integral part of these Specifications, shall serve as the working drawings. The plans indicate the general layout and arrangement of the complete electrical system and other works. D.2. The drawings and specifications are meant specifically to be complementary to each other and where it is called for by one shall be binding as if called for by both. Anything which is basically required to complete the installation for proper operation but not expressly mentioned on the drawings and/or Specifications for proper operation but not expressly mentioned on the drawings and/or specifications shall be furnished and installed by the CONTRACTOR at no extra cost to the NorWD as though specifically stipulated or shown in both. D.3. Procuring Entity shall have the final decision on any apparent conflict between the drawings and specifications or on any under and controversial point in either or both.	

	D.4. All dimensions and locations shown on the plans are approximate and shall be verified in the field, as actual locations, distances, and levels are governed by actual conditions.	
B.	SCOPE OF WORK	
	1. Work Included The work to be done under this work item shall include the furnishing of all tools, labor, equipment, fixtures and materials, each complete and in proper working condition unless one or other is specifically excluded or stated otherwise in these specifications but not limited to the following principal items of work: 1.1 Furnish and install a complete wiring and raceway system for the underground power and telephone distribution system including concrete pedestals, concrete hand holes and necessary wiring gutters and boxes. 1.2 Furnish and install a complete grounding system. 1.3 Perform terminations for all electrical system. 1.4 Complete testing of all electrical systems. 1.5 Preparation of "As-built" drawings. If any item of works or material has been omitted which are necessary for the completion of the Electrical Work as outlined herein before, then such items shall be and hereby included in this section of work.	
C.	PROCEDURE	
	Workmanship The CONTRACTOR shall execute the work in the most thorough, prompt and workmanlike manner and in accordance with the plans and specifications. The installations shall be done thru standard methods and good engineering practices. 1. Materials All materials to be installed shall be brand new except as otherwise noted on the plans or specifications. The materials shall be as specified. No substitution of materials is allowed. Should the CONTRACTOR find it necessary to use another type/brand of materials instead of the specified item, he shall first obtain approval from the Procuring Entity prior to installation. Any substituted material installed without the approval of the Procuring Entity shall be subject to replacement. 2. Coordination:	

	It is the sole responsibility of the CONTRACTOR to conduct coordination of his activities with the following: a. Other trades and suppliers b. Procuring Entity/Project In- Charged c. Local Government Authority d. Deviation from the Plans: No deviation from the plans is to be made unless given notice or approval by the Procuring Entity. e. Record Drawings and "As-Built" plan. The CONTRACTOR is required to keep an active record of the actual installation during the progress of the job. This shall be the reference in the preparation of the "As-Built" plans which shall include all pertinent information, complete in all aspect of the actual installation, and all new information not originally shown in the contract drawings. The "As-Built" plans shall be prepared by the CONTRACTOR at his expense and shall be submitted to the Procuring Entity for approval upon the completion of the work. The approval of the "As-Built" drawings shall be a pre- requisite for the final acceptance of the electrical works. Submit three (3) copies of the "As-Built" drawings signed and dry sealed by the CONTRACTOR'S Registered Professional Electrical Engineer. Original tracing/ reproducible copy shall also be submitted to the Procuring Entity. 3. Samples & Shop Drawings A. 30 days prior to the installation or fabrication of materials the CONTRACTOR shall submit to Procuring Entity the following for approval. a. Shop drawings of panel boards showing arrangements of circuit breakers, bus bar sizes, lugs, etc. Indicate all dimensions. b. Shop drawings or samples required as noted in the drawings. c. Samples and catalogs of materials intended to be installed. B. The CONTRACTOR shall also submit to the Procuring Entity without delay shop drawings and other submittals which may be required by Procuring Entity during the progress of construction. C. The above requirements shall be submitted to the Procuring Entity at the earliest possible time to give allowance for checking and verification. These shall be complete in all aspects. D. Submit five (5) sets of each shop drawings. 4. Electric Power: The CONTRACTOR shall be responsible for his own electric power needed for the Execution of the job.	

	5. TEST Conduit tests on all electrical conductors installed in the presence of the Procuring Entity a. Check for grounds b. Insulation resistance test c. Continuity test for all outlets d. Voltage level test e. Phase relationship f. Check circuit connections at panel boards, all single phase circuit shall be connected to phase as shown in the load schedule. g. Submit Reports On Tests All reports must be formal, typewritten and properly identified. h. All defects found during the test shall be repaired immediately by the CONTRACTOR. i. All tools, equipment and instruments needed to conduct tests shall be on the account of the CONTRACTOR.	
D.	**MATERIALS**	
	A. Conduits a. Rigid Steel Conduits (RSC) and Intermediate Metal Conduit (IMC): 1. Standard trade sizes, hot dipped galvanized with inside enamel or epoxy coating. 2. Joints-threaded coupling for joints. c. Use for power & lighting. b. Polyvinyl Chloride Conduit (PVC) 1. Standard trade sizes, schedule 40 2. Coupling & fittings - standard couplings for joints by solvent weld process. c. Installation of Conduits 1. Installation is in accordance with PEC and of good engineering practice. 2. Use standard trade sizes locknut and bushing at each end terminating in boxes/panel boards. Ensure electrically continuous conduit system. 3. Provide independent conduits supports using hangers, supports or fastenings spaced in accordance with good engineering practice and PEC. 4. Use adjustable trapeze hangers for horizontal parallel runs. 5. Conduits bends shall not be more than the equivalent of three (3) 90 degree bends between pulling points. 6. Conduit threads cut on job shall have same effective lengths, thread dimensions, and taper as factory threads.	

	7. Cut ends of conduit square with hand or power saw and ream to remove burrs and sharp edges. Do not use wheel cutter. 8. Clamps shall be galvanized malleable iron one-hole straps, beam clamps or other approved device with necessary bolts and expansion shields. 9. Trapeze hangers shall be used for parallel runs of conduits. Install conduit clamps at end of each run and at each elbow. 10. All underground conduits installed shall be provided with concrete encasement at least 8cm. thick outer face of conduit. 11. Paint hangers one prime coat of red lead or zinc chromate, and one finish coat of an approved color. Hangers are not detailed but must be adequate to support combined weight of conduit, conductors and hangers. Submit shop drawings for approval. B. WIRES 1. Wires shall be annealed copper, 98% or better conductivity, insulated, single, except as noted in the drawings. 2. 600-volt class type as indicated in the plans. Wires greater than no. 8 sq.mm shall be stranded. 3. Minimum size shall be #3.5THW for power and lighting circuits. Use standard methods in pulling wires. 4. Splices of wires/cables shall be done inside junction boxes or auxiliary gutters using standard connectors. No wires shall be spliced inside conduits. 5. All wires and cables shall be color coded. Each phase will have different color. C. INSULATION All splices shall be properly insulated using electrical tape. Application of insulation tape shall be equivalent to the insulation of the wire concerned. Use filler compound, 'Scotch fill at sharp edges to provide smooth surface before taping. D. PANEL BOARD AND CIRCUIT BREAKER 1. NEMA type/enclosure unless noted, PEC rules and regulations, circuit breaker type shall be 230V, number of poles as required. 2. Panel boards shall contain a single brand of circuit breakers. 3. All circuit breakers used as main shall be "Bolt on" type molded case, thermal magnetic protective, quick make, quick break, trip free from	

	handle, trip indicating, number and size as shown in the schedule. Internal common trip for 2 and 3 pole breakers. 4. Breaker minimum interrupting capacities shall be based on NEMA and UL test procedures.230 volt breakers - 10,000 rms. Symmetrical amperes at 240V A/C (minimum). 5. Word "space" indicated in the schedule shall mean that complete bus, insulators, etc. shall be included ready to accept future circuit breaker of the same frame size as the largest branch circuit breaker. E. SOCKET/OUTLET 1. Ground Outlet is required every 5 square meter. 2. Wall Outlet is required every 5 meters span.	
XII.	**BILL OF QUANTITIES**	
	As per Detailed Design of the Contractor.	
	NOTES: i. The Plans, Detailed Drawings, Specifications, Detailed Bill of Quantities, Contract Agreement and other Bid Documents shall be considered as complementing each other, so that what is mentioned or shown in one, although not mentioned in the other, shall be considered as appearing in both. In case of conflict between the two, the same should be referred to the Planning& Design - Engineer Department for resolution with the approval of the Head of Procuring Entity. ii. The construction shall be finished with first class workmanship to the satisfaction of the Head of Procuring Entity. iii. The items, description and quantities given on The Bill of Quantities /Bid Form, are guides only to the owner/bidder interpreting the plans and technical specifications. The owner is not responsible for any mistakes, inaccuracies, duplications, or omissions in this list of the Bill of Quantities/Bid Form which shall never be a basis for additions nor deletions to the scope of work. Only the entries of the Bidder consisting of his own take off quantities from the plans and technical specifications and his unit cost and corresponding sums shall be considered. iv. The unit and total bid prices must include all direct and indirect cost/expenses such as overhead, contingencies and miscellaneous (OCM); profit; value added tax and other	

	obligations of any kind under which the contract must be borne by the Bidder since they are necessary to install, construct and complete the whole of the contract in accordance with the bid documents. v. The Grand Total Cost shall include the Design, Procurement and Construction including testing and commissioning by the contractor.	

NOTE: Bidders must state either "PASS" or "FAIL" or any equivalent term in the column "Statement of Compliance" against each of the individual parameters of each "Specification".

I hereby certify to comply with all the above Technical Specifications.

Name of Company/Bidder	**Signature over Printed Name of Representative**	**Date**