Project : **PROPOSED STUDENT CENTER & EDUCATION COMPLEX BUILDING**
Location: MUST Main Campus, Lapasan, Cagayan de Oro City
Owner: MINDANAO UNIVERSITY OF SCIENCE & TECHNOLOGY
Subject: **SPECIFICATIONS**

INTRODUCTION

The Drawings and the Specifications are intended to be complementary. Drawings are graphic means of showing works to be done. They are particularly suited to show where materials are located. Thus, the Drawings exist essentially to show sizes, location and placement. Not all works, however, can be presented in the Drawings. Generalized works are usually in statement form; hence the Contractor is strongly advised to read the specifications carefully. Specifications on the other hand are used to describe the materials, construction techniques, samples, shop drawings, guarantee, and the other contract requirements.

Anything shown in the Drawings but not mentioned in the Specifications, vice versa, shall be done as if it were mentioned or indicated in both. Anything not expressly set forth in either but is reasonably implied shall be taken into account as though specifically mentioned or indicated in both. If no numerical indications appear in the Drawings, the measurement shall be carefully followed according to the scale of the Drawings. If there is any conflict or ambiguity in the Drawings and Specifications, the matter shall be presented to the Architect, who shall provide the necessary interpretation or clarification. In cases where specified brand carries with it the manufacture's specifications, the manufacture's specification shall hold the precedence over this Specification.

THE LANGUAGE OF THE SPECIFICATIONS:

The Specifications are in abbreviated type and includes incomplete sentences. The selection of sentence structure depends on the underlying principles of the Specifications:

a. That the technical Specifications are only one part of the Contract Documents:
b. That the Contract is between the Owner and the General Contractor; and
c. That the General Contractor is the only party responsible for completing the work in accordance with the Contract Documents.

Therefore:

a. Only the General Contractor is referred to in the Specifications so as not to violate the intent of the Contract and so as not to undermine the proper chain of command.
b. Any reference to Specialty Trade Contractors in the technical Specifications is made only in so far a selection of Specialty Trade Contractors is made through bidding. Once the Specialty Trade Contractions are selected and assigned to the General Contractor, the General Contractor assumes all responsibilities for the execution of the whole project in accordance with the Contract Documents. Therefore, in the contract between the Owner and the General Contractor, the Specialty Trade Contractor, the Specialty Trade Contractor is not referred to the entire contract Document, the work "Contractor" referred to the General Contractor.
c. The omission of the phrase "the contractor shall" is intentional because the whole Specifications are directed to the Contractor. Omitted words or phrases shall be supplied by the interference in the same manner, as they are when a "note" occurs in the drawings.
d. Where "as shown", "as indented", "as detailed", or words of similar import are used, it shall be understood that reference to the Drawings accompanying the Specifications is made unless otherwise stated.
e. Where "as directed", "as required", "as permitted", "as authorized", "as approved", "as accepted", or other words of similar import are used, it shall be

understood that the direction, requirements, permission, authorization, approval, or acceptance of the Architect is intended unless otherwise stated.

f. As used herein, "provide" shall be understood to mean "provide complete in place", that is, "furnished and installed".

I. GENERAL REQUIREMENTS

1. If errors or omissions appear in the Drawings, Specifications or other documents, these shall be referred to the designing Architect.

2. Cleanliness shall be maintained at all times within the job site and its immediate premises.

3. All applicable provisions of the different divisions of the specification for each work trade shall apply for all items cited in this summary.

4. Materials deemed necessary to complete the work but not specifically mentioned in the Specifications, working Drawings, or in the Contract Documents, shall be supplied and installed by the Contractor without extra cost to the Owner. Such material shall be of the highest quality available, installed and applied in a workmanlike manner at prescribed or appropriate locations.

5. Materials specifically mentioned in this Summary shall be installed following efficient and sound Engineering and Construction practice, especially as per Manufacturer's application and installation specification, which shall govern over all works alluded in this Specification.

II. MOBILIZATION/DEMOBILIZATION

1. The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

2. Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in section 4 of this specification.

3. Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site. This includes the disassembly; removal; and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

4. This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs.

III. TEMPORARY PERIMETER FENCE/FACILITIES

1. Provide, erect, and maintain field offices and adequate facilities for the convenience of workmen and others employed on the work, including all necessary electricity, water, drainage and telephone services for the use of the Project Engineer and his staff.

   a. Office and Contractor's Building– wooden floor raised above ground at 0.60m; room of approx.12 sq.m. for the Project Architect.

   b. Housing for Workers – tents or protection on designated areas.

   c. Sanitary Fixtures and 1st Aid Station – ample sanitary toilets and other conveniences including water connections.

   d. Temporary Barricades and Guard Lights -necessary for proper prosecution and Completion of work. Lights located at false work tower to be provided by contractor.

   e. Temporary Water, Power, And Telephone Facilities – provided by contractor through arrangements with local utility companies. All expenses paid by the contractor

   f. Temporary Signs – no advertisements to be displayed without Architect's approval.

   g. Temporary Roadways – provide proper access

   h. Temporary Stairs, Ladders, Ramps, and Runways -such shall meet requirements of Local laws.

   i. Temporary Elevators and Hoists- install adequate number of elevators and hoists located at sufficient distance from exterior walls.

   j. Temporary Enclosures – exterior doors shall be equipped with self-closing hardware; windows equipped with removable sash frames.

   k. Temporary perimeter fence- color roof color yellow

2. Provide temporary fencing, barriers, guard rails, gangways, walkways and the like for protecting the public and others during proper execution of the Works.

IV. CLEARING AND GRUBBING

1. Clear and/or grub all surface objects and all trees, stumps, roots and other protruding obstructions not designed to remain in place, except as provided below:

   a. Removal of undisturbed stumps and roots and nonperishable solid objects with a depth of 1 meter below sub grade or slope of embankments will not be required.
   b. In areas outside of the grading limits of cut and embankment areas, stumps, and nonperishable solid objects shall be cut off not more than 150 mm (6 inches) above the ground line or low water level.
   c. In areas to be rounded at the top of cut slopes, stumps shall be cut off flush with or below the surface of the final slope line.
   d. Grubbing of pits, channel changes and ditches will be required only to the depth necessitated by the proposed excavation within such areas.

2. If perishable material is burned, it shall be burned under the constant care of component watchmen at such times and in such a manner that the surrounding vegetation, other adjacent property, or anything designated to remain on the right way will not be jeopardized. If permitted, burning shall be done in accordance with laws, ordinances and regulations.

3. Materials and debris which cannot be burned and perishable materials may be disposed of by methods and at locations approved by the Project Engineer, on or off the Project.

4. All clearing and grubbing work shall comply with Item 100 of the DPWH Standard Specifications.

V. REMOVAL OF STRUCTURES AND OBSTRUCTIONS

1. Remove wholly or partly, and satisfactory dispose all buildings, fences, structures, old pavements, abandoned pipelines, and other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed off under other items in the Contract. Salvage all designated materials and backfill the resulting trenches, holes, and pits.

2. All designated salvable material shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored at specified places on the project or as otherwise shown in the Special Provisions.

3. Removal of structures and obstructions shall comply with Item 101 of the DPWH Standard Specifications.

VI. LAYOUT OF FOUNDATION

1. Stake out the building accurately and establish grades according to Plans and Specifications.

2. Prior to any excavation the general area of all building works, services and site works within the contract shall be set out by suitable markers. Levels shall be established and pegged from a common datum. All setting out shall be carefully checked against the drawings prior to commencement and any discrepancies clarified before construction commences.

3. Basic batter board references as directed by the Project Engineer shall be erected at such places where they will not be disturbed during construction.

VII. BORED PILES

1. Bored piles shall be in accordance with plan.

VIII. BORED PILE WORKS

Work shall consist of Bored pile foundation of the type and dimensions designated in the contract documents, including cutting off or building up foundation piles when required. Piling shall conform to and be installed in accordance with these specifications; at the location; and to the elevation, penetration, and the required ultimate pile capacity shown in the contract documents or as directed by the Engineer.

VIIIa. **BORED PILE CONSTRUCTION METHODOLOGY:**

A. MOBILIZATION
- Equipment, material and Manpower Preparation
- Transport of Manpower and Equipment into the site
- Ordering of all necessary material and consumable requirements

A. SITE PREPARATION and LAYOUT

B. STEEL CAGE FABRICATION
- Reinforcing Bar Cutting and bending, base on cutting list.
- Fabrication of Steel Cage and Installation using crane.

C. BORING and DRILLING
- Use Auger bit to make an initial hole
- Install Steel Casing at the upper ground level– if necessary
- Use Drilling bucket to scope up loose soil and haul it up.
- Mix the underground water with Bentonite or plastesizer or any kind of soil stabilizer, to prevent the collapse of wall.
- Constantly collect soil sample at every meter depth, put it in a plastic bag and label it.
- Monitor and measure the depth by using the drop chain.

E. CONCRETE POURING
- Concrete Pouring with the aid of Tremie Pipe
- Allow the bad concrete to overflow
- Pull out the steel casing if any.
- Concrete Curing
- Pile Dynamic Analysis testing

Cast – in – Place Concrete Piles

1. Drilled Holes

All holes for concrete piles cast in drilled holes shall be drilled dry to the tip elevations shown on the Plans. All holes will be examined for straightness and any hole which on visual inspection from the top shows less than one-half the diameter of the hole at the bottom of the hole will be rejected. Suitable casings shall be furnished and placed when required to prevent caving of the hole before concrete is placed.

All loose material existing at the bottom of the hole after drilling operations have been completed shall be removed before placing concrete.

The use of water for drilling operations or for any other purpose where it may enter the hole will not be permitted. All necessary action shall be taken to prevent surface water from entering the hole and all water which may have infiltrated into the hole shall be removed before placing concrete.

Concrete shall be placed by means of suitable tubes. Prior to the initial concrete set, the top 3m of the concrete filled pile or the depth of any reinforcing cage, whichever is greater, shall be consolidated by acceptable vibratory equipment.

Casing, if used in drilling operations, may be left in place or removed from the hole as concrete in placed. The bottom of the casing shall be maintained not more than 1.5m or less than 0.3m below the top of the concrete during withdrawal and placing operations unless otherwise permitted by the Engineer. Separation of the concrete during withdrawal operations shall be avoided by vibrating the casing.

2. Steel Shells and Pipes

The inside of shells and pipes shall be cleaned and all loose materials removed before concrete is placed. The concrete shall be placed in one continuous operation from tip to cut-off elevation and shall be carried on in such manner as to avoid segregation.

The top 3m of concrete filled shells, or to the depth of any reinforcing cage, whichever is greater, shall be consolidated by acceptable vibratory equipment.

Pipes shall be of the diameter shown on the Plans. The pipe wall thickness shall not be less than that shown on the Plans but in no case less than 5mm. The pipe , including end closures. Shall be of sufficient strength to be driven by the specified methods without distortion.

Closure plates and connecting welds shall not project more than 12.5mm beyond the perimeter of the pile tips.

No shell or pipe shall be filled with concrete until all adjacent shells, pipes, or piles within the radius of 1.5m or 4 ½ times the average pile diameter, whichever is greater, have been driven to the required resistance.

After a shell or pipe has been filled with concrete, no shell, pipe or pile shall be driven within 6m thereof until at least 7 days have elapsed.

3. Drilled Shafts

Drilled shafts are deep foundations formed by boring a cylindrical hole into soil and/or rock and filling the hole with concrete. Drilled shafts are also commonly referred to as caissons, bored piles or drilled piers.

Drilled shafts, like driven piles, transfer structural loads to bearing stratum well below the base of the structure bypassing soils having insufficient strength to carry the design loads.

Drilled shafts are classified according to their primary mechanism for deriving load resistance either as floating shafts (i.e., shafts transferring load primarily by side resistance), or end-bearing shafts (i.e., shafts transferring load primarily by tip resistance). Occasionally , the bases of shafts are enlarged(i.e., belled or under reamed) to improved the load capacity of end bearing shafts on less than desirable soils, or to increase the uplift resistance of floating shafts.

Effects of ground and ground water conditions on shaft construction operations should be considered and delineate, when necessary, the general method of construction to be followed to ensure the expected performance. Because shafts derive their capacity from side and tip resistance which is a function of the condition of the materials in direct contact with the shaft, it is important that the construction procedures be consistent with the material conditions assumed in the design. Softening, loosening or other changes in soil and rock conditions caused by the construction method could result in a reduction in shaft capacity and an increase in shaft displacement. Therefore, evaluation of the effects of the shaft construction procedure on load capacity must be considered an inherent aspect of the design.

Drilled shafts are normally sized in 15.24 cm (6-inch diameter increments with a minimum diameter of 45.72 cm (18"). The diameter of shaft socketed into rock should be a minimum of 15.24 cm (6") larger than the socket diameter. If a shaft must be inspected by the entry of a person, the shaft diameter shall not be less than 76.20cm (30").

Drilled shafts constructed in dry, noncaving soils can usually be excavated without lateral support of the hole. Other ground conditions where caving, squeezing or sloughing soils are present require installation of steel casing or use of a slurry for support of the hole. Other ground conditions where caving, squeezing or sloughing soils are present require installation of a steel casing or use of a slurry for support of the hole. Such conditions and techniques may result in loosening of soil around the shaft, or altering of frictional resistance between the concrete shaft and surrounding soil.

The center-to-center spacing between shafts is normally restricted to a minimum of 3B to minimize the effects of the interaction between adjacent during construction or in service. However, larger spacings may be required where drilling operations are difficult or where construction must be completed in very short time frames.

Particular attentions should be given to the potential for deposition of loose or wet material in the bottom of the hole, or the build up of a cake of soft material around the shaft perimeter prior to concrete placement. Adequate cleaning and inspection of rock sockets should always be performed to assure good contact along the rock and shaft concrete. If good contact along the shaft cannot be confirmed, it may be necessary to assume that all load is transferred to the tip. If the deposition of soft or loose material in the bottom of the hole is expected. The shaft may have to be designed to carry the entire design load through side resistance.

A number of methods can be used to prevent caving during the drilling of holes and the placement of concrete. It is preferred that drilled shafts be constructed in stable

non-sloughing soil without excessive ground water. If impossible , consider the following three different construction methods:

a . The construction of the pile or shaft in a wet condition while walls of the excavation are stabilized by hydrostatic pressure of water or mineral slurry until the concrete is placed by tremie methods for the full length of the pile.

Mineral slurry used in the drilling process shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage And specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained in a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water and adequate time alloted for hydration prior to introduction into the shaft excavation. Adequate slurry tanks will be required when specified. No excavated slurry pits will be allowed when slurry tanks are required on the project without the written permission of the Engineer. Adequate desanding equipment will be required when specified. Steps shall be taken as necessary to prevent the slurry from "setting up" in the shaft excavation, such as agitation, circulation, and adjusting the properties of the slurry.

Control tests using suitable apparatus shall be carried out by the Contractor on the mineral slurry to determine density, viscosity, and pH. An acceptable range of values for those physical properties is shown in the following table.

RANGE OF VALUES (At 20 [68F])

Property (Units)	Time of Slurry Introduction	Time of Concreting (In Hole)	Test Method
Density (Kn/m^3)	10.10 to 10.86 64.3 to 69.1	10.10 to 11.79 64.3 to 75.0	Density Balance
Viscosity (sec. per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH Paper or Meter

Note:

a.) Increase density values by 0.314 KN/m^3 (2 pcf) in salt water.

b.) If desanding is required; sand content shall not exceed 4 percent (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Test to determined density, viscosity and pH values shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 3.05 m (10feet) for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

b. The use of steel casing which is installed during drilling operations to hold the hole open and usually withdrawn during concrete placement.

Casing, if used in operation, shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be

less than the specified size of the shaft. It shall conform to AASHTO M- 270 (ASTM A-709) Grade 36 unless otherwise specified.

Temporary casings shall be removed while the concrete remains workable. Generally the removal of temporary casing shall not be started until concrete placement in the shaft is at or above ground surface. Movement of casing by rotating, exerting downward pressure and tapping to facilitate extraction with a vibratory hammer will be permitted. Casing extraction shall be at a low, uniform rate with the pull in line with the shaft axis.

A sufficient head of concrete shall be maintained above the bottom of the casing to overcome the hydrostatic pressure of water or drilling fluid outside the casing.

c. The use of permanent casing which is left in place within the portion of the pile which is in unstable material.

Construction Tolerances:

The following tolerances shall be maintained in constructing drilled shaft.

a. The drilled shaft shall be within 7.62cm (6") of the plan position in the horizontal plane at the plan elevation of the top of the shaft.
b. The vertical alignment of the shaft excavation shall not vary from the plan alignment by more than 20.83 mm/m (1/4 inch per foot) of depth.
c. After all the shaft concrete is placed, the top of the reinforcing steel cage shall be no more than 15.24 cm (6") above and no more than 7.62 cm (3") below plan position.
d. When casing is used, its outside diameter shall not be less than the shaft diameter shown on the plans. When casing is not used, the minimum diameter of the drilled shaft shall be the diameter shown on the plans for diameters 60.96 cm (24") or less, and not more than 2.54cm (1 inch) less than the diameter shown on the plans for diameters greater than 60.96 cm (24").
e. The bearing area of bells shall be excavated to the plan bearing area as a minimum. All other plan dimensions shown for the bells may be varied, when approved, to accommodate the equipment used.
f. The top elevation of the shaft shall be within 2.54 cm (1 inch) of the plan top of shaft elevation.
g. The bottom of the shaft excavation shall be normal to the axis of the shaft within 62.5 mm/m (3/4 inch per foot) of shaft diameter.
Drilled shaft excavations constructed in such manner that the concrete shaft cannot be completed within the required tolerances are unacceptable.

IX. EXCAVATION

1. For roadway excavation, excavate and grade roadways, parking areas intersections, approaches, slope rounding, benching, waterways and ditches; remove unsuitable material from the roadbed and beneath embankment areas.

2. For borrow excavation, excavate and utilize approved material required for the construction of embankments or other portions of the work. Material shall be obtained from approved sources.

3. When there is evidence of discrepancies on the actual elevations and that shown on the Plans, a pre-construction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the Engineer to serve as basis for the computation of the actual volume of the excavated materials.

4. Conservation of Topsoil. Suitable topsoil encountered in excavation and on areas where embankment is to be placed shall be removed to such extent and to such depth as the Engineer may direct. The removed topsoil shall be transported and deposited in storage piles at locations approved by the Engineer. The topsoil shall be completely removed to the required depth from any designated area prior to the beginning of regular excavation or embankment work in the area and shall be kept separate from other excavated materials for later use.

5. Utilization of excavated materials. All suitable material removed from the excavation shall be used for the formation of the embankment, sub grade, shoulders, slopes, bedding, and backfill for structures, and for other purposes shown on the Plans or as directed.

   All excess material, including rock and boulders that cannot be used in embankments shall be disposed off as directed.

   Borrow material shall not be placed until after the readily accessible roadway excavation has been placed in the fill, unless otherwise permitted or directed by the Engineer. If the amount of borrow placed is more than what is required, the amount of such waste will be deducted from the borrow volume.

6. Prewatering. Excavation areas and borrow pits may be prewatered before excavating the material. When prewatering is used, the areas to be excavated shall be moistened to the full depth, from the surface to the bottom of the excavation. The water shall be controlled so htat the excavated material will contain the proper moisture to permit compaction to the specified density with the use of standard compacting equipment. Prewatering shall be supplemented where necessary, by truck watering units, to ensure that the embankment material contains the proper moisture at the time of compaction.The contractor shall provide drilling equipment capable of suitably checking the moisture penetration to the full depth of the excavation.

7. Presplitting. Unless otherwise provided in the Contract, rock excavation which requires drilling and shooting shall be presplit. Presplitting to obtain faces in the rock and shale formations shall be performed by: (1) drilling holes at uniform intervals along the slope lines, (2) loading and stemming the holes with appropriate explosives and stemming material, and (3) detonating the holes simultaneously.

8. Excavation of Roadbed Level. Rock shall be excavated to a depth of 150 mm (6 inches) below sub grade within the limits of the roadbed, and the excavation backfilled with material designated on the Plans or approved by the Engineer and compacted to the required density.

9. Borrow Areas. All borrow areas shall be bladed and left in such shape as to permit accurate measurements after excavation has been completed. The Contractor shall not excavate beyond the dimensions and elevations established, and no material shall be removed prior to the staking out and cross-sectioning of the site. The finished borrow areas shall be approximately true to line and grade established and specified and shall be finished.

10. All Excavation Works shall comply with Item 102 of DPWH Standard Specifications.

X. EQUIPMENTS

1. Provide the following equipments needed for the execution of works:

   A. Bored piling major and minor equipment to be use.

   a. 1 set of Bored Piling Rig w/ Auger and Bucket
   b. 1 unit of 40 tons Supporting Crawler crane / Telescopic Crane
   c. 1 set of Tremie Pipe
   d. 2 unit Steel Casing x 6 meter
   e. 1 set 220 KVA Gen Set
   f. 1 set 45 KW Vibro Hammer
   g. 1 set Desanding Machine
   h. 1 unit 5 hp submersible pump
   i. 2 set Welding Machine
   j. 1 set Bentonite Tank

   B. Construction

   a. Total Station Survey Instrument
   b. Concrete Cutter
   c. 1 unit 0.7 cu Backhoe
   d. 2 units Hand Roller Compactor
   e. 2 units Plate Compactor
   f. 1 unit Boom Truck
   g. 1 unit Tower Crane tip load 1 ton, main jib 10 tons
   h. Electric Bar Cutter
   i. 1 Bar Bender
   j. 1 Pump Crete
   k. 2 units Bagger Mixer (1 Bagger)
   l. 4 units Transit Mixer (5 cu.m. cap.) owned or sourced out
   m. 5 units Concrete Vibrator
   n. 5 Cutting Outfit
   o. Batching plant owned or sourced out.

XI. EARTH SOIL

1. Excavation shall not be backfilled until such structures and properties as drainage, insulation pipes, construction details, and water tightness have been inspected, tested and approved by the Project Engineer.

2. For general fill, use sand, gravel or suitable soils of organic materials, cinders, trash, masonry or rubble, and free of stones having a diameter greater than 6 inches.

3. All available precaution shall be taken during back filling to ensure that the pipes, insulation and construction details are not damaged.

4. All backfill material shall be approved and free from vegetable or organic material, mud, refuse, boulders, rock , stones of over 15 cm and other materials which, in the opinion of the Project Engineer, are unsuitable.

5. All soil fill material used shall be thoroughly compacted by mechanical means until the specified degree of compaction is obtained. The filling Material shall be approved by the Engineer and placed in even layers of a depth not greater than 30cm, each layer being thoroughly compacted by wetting and tamping.

6. A driven roller of least 10 tons shall make at least 10 trips for each layer unless otherwise specified. Every effort shall be made to compact the fill material at its optimum moisture content for compaction. In any case, the dry density of compacted soil shall not be less than 95% of the value obtained in a standard laboratory test.

7. Filling shall be carried out in such away and to such a generous depth as to ensure that the final surfaces after settlement and compaction conform to the levels indicated in the Drawings and Specifications.

8. Bottoms of footings shall be founded on concrete pile and shall be leveled and free of loss rock, dirt debris, and standing water prior to placing of concrete.

9. Selected appropriate anti-termite method approved by the Engineer shall be executed in accordance with the local procedures and Manufacturers instruction on the excavation bottom surface and the materials used for filling or backfilling and to the sores.

XII. AGGREGATE BASE COURSE (ROAD)

1. The aggregate shall consist of hard, durable particles or fragments of stone or gravel and sand or other fine mineral particles free from vegetable matter and lumps or balls of clay and of such nature that it can be compacted readily to form a firm, stable layer. It shall conform to the grading requirements shown in table 300.1 on Item 300 of the DPWH Standard Specifications.

2. Aggregate surface course shall be placed in accordance with the accordance with the requirements of Item 201, Aggregate Base Course, of the DPWH Standard Specifications.

3. Aggregate surface course shall be compacted in accordance with the accordance with the requirements of Item 201, Aggregate Base Course, of the DPWH Standard Specifications.

XIII. GRAVEL BASE

1. Provide 1-1/2"ø Crushed Gravel fill beneath all concrete slabs on grade.

2. Place gravel fills to depth shown and in no case less than 4 inches deep and compact with tamper to key the stones into a firm base.

XIV. CONCRETE WORKS

1. Upon delivery at site work, cement and admixture shall be stored separately in dry, weather tight, properly ventilated structure with adequate provision for prevention of absorption of moisture.

2. Aggregates shall be stored in a manner to assure good drainage to preclude inclusion of foreign matters and to preserve the gradation. Fine aggregate shall be protected from wind-caused segregation.

3. Fine aggregates shall consist of natural sand, manufactured sand or combination of the two and shall be composed of clean, hard and durable spherical or curvical particles.

4. Coarse aggregates shall consist of crushed or uncrushed gravel, crushed stones or a combination thereof and shall be clean, hard. Uncoated particles of maximum nominal size 3/4".

5. Water shall be clean, fresh and free from injurious amount of oil, acid, salt, alkali, organic matter, or other deleterious substances.

6. Concrete of various classes indicated and as required under other section for different usage shall be proportioned and mixed by volumetric batching and continuous mixing in accordance with ASTM C685.

   Minimum compressive strength of each component shall be as follows:

   a. Footings/Slab

Footings	5,000 psi
Slab-on-grade	5,000 psi
Slab on deck	5,000 psi

   b. Structural Components

Columns	5,000 psi
Beams	5,000 psi

7. Concrete shall be placed in forms or excavated portions as close as possible in final position, in uniform approximately horizontal layers not over 12 inches deep unless otherwise directed. Concrete shall not be allowed to drop freely more than 5 feet in unexposed work nor 3 feet in exposed work.

8. Immediately after placing each layer of concrete shall be compacted by hand spading, rodding and tamping.

9. Concrete shall be protected against moisture loss, rapid temperature changes, mechanical injury and injury from rain of flowing water for a period of 7 days.

10. Cement: Use Holcim brand for the whole work.

XV. REINFORCING STEEL

1. Drawings shall show the details and dimensions of all components parts including plan and elevation views, cross sections and details.

2. For reinforcing bars, use grade 40.

3. Provide concrete reinforcement, which is made from new billet steel and free of rust, dirt, oil and grease and any other foreign substances detrimental to the bonding with concrete.

4. Secure reinforcement with accessories and the wire to prevent displacement before and during concreting.

5. Lap-splice all bars up to No. 11 in accordance with ACI 318.

XVI. WATER PROOFING

1. Waterproof areas for Roof Deck Slab, Elevator Pit, upper floor Toilet Slabs and other areas exposed to water or subject to moisture penetration where waterproofing is deemed necessary.

2. For Cementitious Waterproofing, " Use Grayseal or its equivalent"

3. Apply water proofing in accordance with Product Application Instructions.

XVII. MASONRY

1. Concrete hollow blocks shall be of approved kind by the Project Engineer.

2. Mortar aggregate shall be natural river sand, clean free from soluble salts and organic matter, graded from fine to coarse, compatible with the thickness of joints in which it is used.

3. Cement shall be Holcim Wallright cement or its equivalent.

4. Mix mortar from 3 to 5 minutes in such quantities as are needed for immediate use. No re-tempering will be permitted if mortar stiffens because of premature setting.

5. Concrete Hollow Block shall be of Approved sample (ASTM C129) with minimum compressive strength of 350 psi. 100 mm (4") and 150 mm (6") thickness as indicated in the plans.

XVIII. DOORS

1. Doors for the following areas shall be as follows:

Medical Clinic, Saws Office, Offices 12mm thick tempered glass on FD 100 section for top & bottom frames with concealed type door closer, stainless steel handle, locksets & accessories

RSIS, Guidance Coordinator, Dental Clinic, 101,	Rapid Steel Doors Primea
Medical Clinic, Classrooms, Offices, finished,	Powder coated wood grain
Conference Room, VP Student Affairs, Sports Development, Arts and Culture Office, AVR, Control Room, Backstage	Includes lock set, deadbolt, Door viewer & hinges

Commercial Spaces 12MM thick tempered glass on FD 100 section for top &bottom frames with concealed type door closer, stainless steel handle, locksets & accessories

Male Toilets, Female Toilets, Toilets Rapid Steel Doors Primea 101, powder coated wood grain finished, includes lock set, deadbolt, door viewer & hinges

Electrical Room, Server Room, Pump Room, ACCU Room, Transformer Area, Storage Room includes lock set, deadbolt, door viewer & hinges	Rapid Steel Doors Primea 101. powder coated wood grain finished,

Pipe Chase Rapid Steel Doors Primea 101, powder coated wood grain finished, includes lock set, deadbolt, door viewer & hinges

Audio Visual Room Rapid Steel Doors Double Leaf Primea 101, powder coated wood grain finished, includes lock set, deadbolt, door viewer & hinges

Speech Lab Rapid Steel Doors Single Leaf, B.I. Ga. #26 with 6mm Glass Window

Toilet, Toilets for Person with Disabilities	Phenolic Door
Generator Set Area	Steel Lattice Door

2. Glass and Phenolic doors as indicated on Plans belong to separate Item nos. XIX Glass Works and XXX Phenolic Partitions on this Specification.

3. All work shall be in accordance with detail drawings or where not detailed shall be in accordance with Manufacturer's standards. Rigidly construct all steel framing true to line, levels and dimensions and adequately braced, anchored or secured.

4. Locks shall be fitted in their respective doors and then removed in case of unfinished doors, until after painting is complete. All other hardware, except butts, shall be applied after all painting is complete. On Completion, all hardware shall securely attach and adjusted to proper operation.

Hardware

1. Hardware finishes specified are in accordance with U.S. Standard Finishes.

2. Unless otherwise specified, all locksets and trims, flush bolts, push plates, pulls, and knobs and other finishing hardware shall be polished chromium plate over nickel or brass.

3. After hardware has been properly fitted, all exposed items such as knobs, escutcheons, plates, locks etc. shall be removed until final coat of painters finished has been applied. When finish coat has been thoroughly dried, install exposed items. All hardware not removed before painting shall be properly masked.

4. Unless otherwise specified, locate hardware as follows:

   a.) Doorknobs shall be 39" from finish floor level to center of knob.
   b.) Push plates shall be 60" from finish floor level to center of push plate.
   c.) Door pulls shall be 40" from finish floor level to grip center.
   d.) Cylinder dead lock shall be 55" from finish floor level to center of lock.

5. The number but hinges to be furnished for each door shall be determined as follows:

   a.) For doors 5'-0" high or less, provide two (2) butts.
   b.) For doors over 5'-0" but less than 7'-0" high, provide three (3) butts, unless otherwise required.
   c.) For doors over 7'-0" high unless otherwise required, provide additional one (1) butt for every 2'-0" or fraction thereof.
   But hinges shall be 8" from top and bottom of floor to center of hinges and the rests equally spaced.

6. Door Hardware
   6.1 Lockset:
      a. HAFELE Stainless Steel, Matt Finish
   6.2 Door Handle:
      a. HAFELE Stainless Steel, Matt Finish
   6.3 Hinges:
      a. HAFELE, Loose Pin Hinges
   6.4 Door Closer: HAFELE or an approved equal, stainless steel finish, regular arm. For all doors.
   6.5 Panic Device for Exit: HAFELE
   6.6 Door stopper: Rubber or metal door stop. As required
      a. Accessories: Color, design, size, and materials for Architect's approval.

XIX. GLASS WORKS (DOORS, WINDOWS AND LATTICE)

1. Use the following Glass specifications with its corresponding items:

    a. FD100 section for top & bottom frames on 12mm thk Tempered Clear Glass
    b. 6mm (1/4") thick reflective blue for curtain wall and awning windows.
    c. 6mm (1/4") thick reflective blue for sliding and fixed window at second floor to fifth floor.
    d. 6mm (1/4") thick clear float for sliding and fixed window at ground floor.
    e. 10mm thk Clear Float Glass on Powdercoated white frame fixed window

2. Glazing
    a. Bulk compound such as: Mastic sealants.
    b. Preformed sealants and synthetic polymer base or preformed gaskets.
    c. Glass framing shall be Standard Aluminum Section. Powder coated finish colored white exterior type. Submit sample for approval.

XX. RAILINGS- STAINLESS STEEL

1. Stairs and hallway railings shall be of:

Top Rail	2"ø Stainless Steel 304
Secondary Rail	1 ½"ø Stainless Steel 304
Railing Post	2" x ¼" Flat Bar

2. Railing system shall be permanently anchored.

3. All mechanical fasteners used in the assembly of railings shall be manufactured from Stainless Steel

4. Erect work [square and level,] [horizontal or parallel to rake of steps or ramp,] rigid, [and] free from distortion or defects detrimental to appearance or performance.

XXI. FORMS AND SCAFFOLDINGS

1. Design, construct, erect, brace, maintain and remove forms in conformance with the requirements of ACI 318 part 1, 2 and 3 inclusive and ACI 347 for loads and stresses.

2. Clean form before each use and apply form oil.

3. Use metal forms and scaffoldings. 12mm (1/2") thick plywood forms may be used where metal forms are not applicable. Plywood forms should be free from warp and gross deformities, sufficiently braced with solid lumber, and applied with the form release agent at its casting before each casting.

4. Forms and supports shall remain in place until the concrete has attained sufficient strength to support the loads to be applied, but in no case shall they be removed in less than the following minimum periods.

Columns	2 days
Walls	2 days
Sides of beams and girders	2 days
Floor slabs	14 days
Shoring for beams and girders	14 days
Beams and girders	14 days

XXII. TILE WORKS

1. Use the following Floor tiles for each area, as per approved sample:

Location	Material	Color
FF1: CDIO Office, Classroom, Medical Clinic, Dental Clinic, RSIS, Guidance Office,Office	60cm x 60cm High Polished Granite Tiles	Refer to Architect
FF2: Lobby, Hallway, Assembly Area, Stairs	60cm x 60 cm Rustic Granite Tiles	Refer to Architect
FF3: Comfort Rooms	30cm x 30cm Semi-polish granite tiles	Refer to Architect
FF4: ACCU Area, Storage, Electrical room, server room, Commercial Spaces	Plain cement finished	natural
FF5: AVR	45cm x 45cm x 3mm Carpet design series vinyl tiles	Refer to Architect

2. Use the following Wall tiles for the following areas, as per approved sample:

   Restrooms -30cm x 30cm High Polished Tiles, Color: Refer to Architect; complete with accessories
   Elevator Lobby wall -60cm x 60cm ¾" thk Black Galaxy Granite slab

3. For Toilet Countertop, use ¾" thk Black Galaxy Granite Slab.

4. Wall and floor tiles shall be free from lamination, serrated edges, chipped-of-corners, and other imperfection affecting their quality, appearance and strength.

5. Upon removal of forms of concrete surface and upon completion of hollow block partitions, where granite wall tiles are to be applied, said surfaces shall be roughened further with picks or similar tools, cleaned thoroughly with water. The surface must be kept wet at least four (4) hours before applying cement mortar in the proportion of one (1) part Portland cement to two (2) parts sand by volume shall not sound and smooth even surface to receive the tiles.

6. Apply adhesive on dry masonry, using serrated trowel with serration approximately 1/8" deep and 1'8" apart. Apply tiles within two hours after adhesive has been trawled on surface. Apply tiles so that adequate contact is made between adhesive and tile. Do not permit any of the adhesives to squeeze up between the tiles. Tiles should not be grouted until twenty-four (24) hours has elapsed.

7. Use Powerbond adhesive for the installation of Vinyl tiles. After installation, apply 1 coat of Power Strip floor stripper, Power Seal floor sealer, and Power Shine floor polish on tiles.

8. For stair nosing, use PVC Nosing soft – 2" x 8' x 2.0mm. Install nosing with "No More Nails Construction Adhesive".

XXIII. CEILING WORKS

1. Ceiling Finishes per area are as follows:

Location	Material	Texture	Color Reference
CF1: Restrooms, Assembly Area, Commercial Areas	6mm Hardiflex on Light Metal Frames	Painted Plain	Refer to Architect
CF2: Offices, RSIS, Guidance office, Speech Lab	9mm x 0.60m x 1.2m pvc laminated Gypsum Board on T-runner powder coated white, with 6mm hardiflex board on light metal frame	Texture, painted	white
CF3: Lobby, Hallway, stairs, electrical room, server room, Classroom	Smooth Plaster Finish	Painted Plain	Refer to Architect
CF4: AVR	9mm x 0.60m x 1.2m Acoustic Gypsum Board on T-runner powder coated white	Textured	white

2. Install ceiling in accordance with Manufacturer's standards and installation procedures.

XXIV. ELEVATOR

1. Install in accordance with Manufacturer's drawings and direction.

2. Product Specifications

- Mitsubishi Elevator Specifications
  E/SA-QC12/202

a. Elevator A & B

Two (2) unit Passenger elevator, Nexiez MR Series, carrying capacity of 550kgs (8 persons), rated speed of 60 meters/minute, 8 stops/openings in line.

DESIGNATION	P.E. A	P.E. B
Type of Building	School	
Elevator Use/Model	Passenger/Nexiez MR Series (with Machine Room)	
Number of Unit(s)	One (1)	One (1)
Capacity	550kgs (8persons)	
Speed	60meters/minute	
Control	Variable voltage, variable frequency (VVVF)	
Operation	1C-2BC (Selective collective fully automatic with or without attendant service)	
Travel	25.00 meters	25.00 meters
No. of Stops	Eight (8)	Eight (8)
No. of Openings	Front- Eight(8) Rear- None	Front- Six (8) Rear- None
Shaft Size	(W) 1800mm x (D) 1600mm	
Car Size	(W) 1400mm x (D) 1030mm	
Pit Depth	1360mm (required)	

Overhead Clearance		4400mm (required)	
Car Design			
Ceiling (N11S)		Hairline-finished stainless steel sheet with downlights	
Walls		Hairline-finished stainless steel sheet with pipe type handrail made of stain at three (3) sides	
Transom		Hairline-finished stainless steel	
Door		Hairline-finished stainless steel	
Front Return Panel		Hairline-finished stainless steel	
Kick Plates		Hairline-finished stainless steel	
Floor		Granite tiles by Owner (12mm in thickness), Mitsubishi to provide 16mm floor recess	
Provision for interior design		80kgs	
Door Type		Two panel center opening with safety door edge on both sides and driven door motor	
Hoistway Entrance			
Size of Openings		(J) 800mm x (H) 2100mm	
Doors	(Ground Floor)	Hairline-finished stainless steel	
	(Other Floors)	Painted steel sheet in color selected (automotive lacquer)	
Jambs	(Ground Floor)	E-102S: Narrow lintel and jambs without transom panel of hairline-finished steel sheet	
	(Other Floors)	E-102S: Narrow lintel and jambs without transom panel of hairline-finished steel sheet in color MUST Blue.	
Entrance Sill		Extruded Hard Aluminum	
Signals		Mark ("G, 2,3,4,5,6,7,8")	Mark ("G, 2,3,4,5,6")
Car Operating Panel		Type CBF-C240 of hairline-finished stainless steel faceplate with micro stroke click flat type button at front return panel	
Car Position Indicator		Incorporated with Type CBF-C240	
Hall Position Indicator		Type PIF-C210N of hairline-finished stainless steel faceplate with micro stroke click flat type button at all floors	
Hall Buttons		Incorporated with Type PIF-C210N @ all floors	
Electric Power Supply		230 VAC, 3Phase, 60Hertz	
Electric Lighting Supply		230 VAC, 1Phase, 60Hertz	
Machine Room		Directly above the hoistway	

Additional Features:

Accessories & Other Features	Attendant Service (AS)
	Automatic electronic car arrival chime (AECC)
	Basic announcement (AAN-B)
	Emergency Exit
	Emergency car lighting with charger (ECL-C)
	Extended door open button (DKO-TB)
	Emergency bell (EMB)
	False call canceling – automatic (FCC-A)
	False call canceling – car type button (FCC-P)
	Interphone (ITP)
	Mitsubishi emergency landing device (MELD)
	Overload protective device with alarm bell and signal light (OLHL)
	Safety door edge (SDE)
	Safety ray (2-beams)
	Secret call service button (SCS-B)

	Ventilation fan

Standard Features:

	Safe Landing (SFL)
	Next Landing NXL)
	Automatic bypass (ABP)
	Overload Holding Stop (OLH)
	Car call canceling (CCC)
	Car fan shut off – automatic (CFO-A)
	Car light shut off – automatic (CLO-A)
	Door nudging feature – with buzzer (NDG)
	Door sensor self-diagnosis (DODA)
	Automatic door speed control (DSAC)
	Reopen with hall button (ROHB)
	Repeated door-close (RDC)
	Door load detector (DLD)

XXV. AVR CHAIR

1. AVR Chairs should be LBPI model FM-11 brand or its approved equivalent.
2. Product Specifications

A. Primary Technic

Height of chair	1000mm	distance center to center	580mm
Seating cushion height	430mm	Row distance	≥ 900mm
Height of arm	605mm	Least length of arm	410mm
Most Length of arm	720mm	Density of foam	45kg/m^3
seating cushion length	430mm	MAX supporting weight	150kg
width of chair	580mm	least Times of reversal	≥150000 times

B. Technical Note

Leg : Iron floor mounted leg to meet the needs of under-floor air-distribution system.

Reply agencies : replied by spring and damping agencies. the springback speed could be adjusted. no noise. With soft return seat sets.

Row distance : it could be made as actual demand, so that we can make sure the width of gangway.

Arm : imported Solid Wood, beautiful wood grain, the color is fitted for the cloth.with concealed, anti panic writing tablet.

Seat/back board : multi-storey wood panels repressed by mechanism, painted with polyurethane Clear coat finish round the board. plywood molded by hot aluminum forming,
Red beechwood board stick up on plywood. The Thickness is equal or greater than 17MM. all wood is dealed with dehydration and degrease. The rate of water content is is equal or lesser than 12%, And dealed with antisepsis protection against insects. Painted environmental water Matt paint. The color could be decided as client.

Fabrics of chair : using 100% Polyester fabrics. Color blue. flame resistance: B1 grades. Fire retardant foam and fabric.

Dustproof, antifouling, protection against the tide, prevention of statical electricity, moth proofing. Has no rupture ,rupture and cotton ball. fast colours.

The foam sponge of cushion : machining with Cold polyurethane foam. The density of backcushion foam sponge is 40kg/m3,the thickness back foam sponge is 60MM. The density of seatcushion is 55 kg/m3, the thickness of seatcushion is 100MM. the density of foam sponge is comfortable for human body. flame resistance: B1 grades..

Seat reposition : Noise free, rebound damping driven.,it has buffer agencies Slowing down .

The material of rebound damping is 65Mn. It's life time is equal or greater than 200000 times. The DP Dashpot Parts use air pressure and air-powered principle. The Performance is Stable, Tighted rigorously, The DP Dashpot Part's life time is equal or greater than 50000 times.

XXVI. ROOFING

1. Roofing shall be 0.40mm thk Spandek 1220 pre-painted galvalum 55 Long Span Color Roof by Philmetal Roofing.

2. Install in accordance with Manufacturer's Standards and Installation Guide.

XXVII. ALUMINUM CLADDING

1. Use " Allusign" for exterior aluminum cladding, Color: refer to Architect

2. Materials shall be new and of first class quality, free from defects and imperfections

3. Mastic tape to be used between the cladding and the underlying purlins and girts shall be of an approved fabrication and suitable for the intended use.

4. Filler blocks shall be of hard-pressed flexible PVC foam or another approved material. Glue for filler blocks shall be according to the supplier's recommendation.

5. All cladding shall be erected square and true to line and level, and in precise positions as shown on the Drawings.

6. Temporary bracing shall be introduced wherever necessary to provide for loads and stresses to which the structure may be subjected by the erection equipment and its operation. Temporary bracing shall be left in place as long as required for safeguarding all parts of the Works.

XXVIII. SHELVES AND COUNTERS

1. Receiving Counter at Offices shall be of ½" thk MDF Board.

2. All rough carpentry work shall be in accordance with detail drawings or where not detailed shall be in accordance with recognized carpentry standards. Rigidly construct all framing true to line, levels and dimensions and adequately braced, anchored or secured.

3. Any surface of the installation that may be exposed shall be smooth and nonabrasive.

4. Wood with excessive graining shall not be accepted

XXIX. CLASSROOM BOARDS

1. Provide One (1) Chalk Board and One (1) White Board for each classroom with sizes as specified on Drawings.

XXX. PHENOLIC PARTITION AT COMFORT ROOMS

1. Toilet partitions shall be 13mm solid core Phenolic material distributed by LBPI.

2. Furnish labor and materials such as hinge, corner fastener, handle, lock, hanger and footing necessary for completion of work as shown in approved drawings.

3. Compartments and urinal screens shall be installed in accordance with installation instructions. All components shall be rigid, straight and plumb. Doors and panels mounted 4" above the finished floor.

XXXI. PLUMBING WORKS

A. General

1. All dimensional locations of fixtures, drains, riser and pipe chase shall be verified on the Drawings and Manufacturer's catalogue.
2. It is not intended that the drawing shall show every pipe, fitting, valve and appliance. All such items whether specifically mentioned or not, or indicated on the Drawings shall be furnished and installed, if necessary, to complete the system in accordance with the best practice of the plumbing trade.
3. Work, included under this section of the Specifications consists in furnishing all labor, tools, equipment, appliances and materials necessary for complete installation, testing and operation of the plumbing system.
4. All plumbing works to be done and sizes of pipes to be used shall be in accordance with the National Plumbing Code of the Philippines.

B. Plumbing Fixtures and Trims

1. All fixtures shall be completely new, free from defects, function efficiently and shall be cleaned, with trims polished and ready for use before acceptance.
2. All plumbing fixtures and equipment shall be installed free and open in a manner to provide easy access for cleaning and shall be furnished with all brackets, cleats, plates and anchors required to support the fixtures and equipment rigidly in place.
3. The product shall be HCG.
4. Unless otherwise specified, all fittings, escutcheons, faucets, traps, exposed piping and trims, shall be brass chrome plate over nickel plate with polished finish.
5. Install all fixtures level and flush with finish floors and partitions.
6. All fixtures shall be provided with individual shut-off valves for cold water supplies so that any fixture may be separately controlled without affecting other fixtures supplied with the same distribution line.
7. Every plumbing fixture or equipment requiring connections to the sanitary drainage system shall be equipped with a trap.
8. Each trap shall be placed as near as possible to the fixtures. No fixture shall be double-trap.
9. After installation of any or all the plumbing fixtures of the building, same shall be kept clean and in working order, but shall not be used by anyone until the building has been formally turned over to the Owner and accepted.
10. Water running test shall be conducted for all fixtures in order to insure soundness, leakage-free and quiet operation

C. Material Specifications

1. Roughing In:
   a. Sewer: PVC Emerald Series 1000.
   b. Drainage: PVC Emerald Series 1000
   c. Water line: PPR Belden pipes
   d. Storm Drainage: Concrete Pipe
   e. Clean Out: Brass type on all floor outlets. All clean out shall be flushed to flooring or wall as the case may be.
   f. All fittings and piping accessories shall be of the standard type.

2. Toilet Fixtures:
   a. Water Closet: HCG Institutional type, Legato elongated Top Inlet flash valve Type, 6 LPF, with seat & cover (FU Mechanism); Flush Valve shall be Sloan Gem 6LPF flush valve fitting for water closet with 1 ¼" dia. vacuum breaker.
   b. Lavatory: 4012 UC Avalon, Undercounter wash basin
   c. Urinal: Kohoutek Wall Hung, supplied with spreader; Flush valve shall be sloan gem 3.8 LPF fitting for urinal with ¾" dia. vacuum breaker.
   d. Paper Holder: HCG
   e. Lavatory Faucet: LF5001 PX, Square Lever handle on round body, single elongated basin mixer supplied with Push button pop-up assembly, Flexible hose angle valves and P-trap
   f. Soap holder: Stainless
   g. WC and Lavatory Flexible Pipe: Stainless Steel Braided Hose
   h. Angle Valve: US
   i. Disabled Grab Bars: 38mm dia. x 400mm length Stainless Steel.

3. Plumbing Fittings:
   a. Floor Drain: 6" square stainless
   b. Gate Valve: us heavy duty
   c. Ball Valve: us heavy duty
   d. Check Valve: us heavy duty
   e. Ordinary Faucet and Hose Bibb: for slope sink
   f. WC and Lavatory Flexible Pipe: Stainless Steel Braided Hose
   g. Angle Valve: us ½" diameter

4. Pipes:
   a. Sanitary pipes : PVC Emerald
   b. Water pipes : PPR Belden, Unitec.
   c. Street Sewer : Reinforce Concrete Pipes sizes refers to plan

5. Water Tank:
   "Tankee" Stainless water tank, Model 20,000 Horizontal Tank.

D. Workmanship

1. All work shall be done and executed in accordance with the standard engineering methods and relations and with the Building and Plumbing Code requirements as called for the design of the project in strict compliance to the plans and specifications.
2. Test:After complete connection and installation of all the owner equipment, the Plumbing Contractor Shall test all work and equipments required by the authorities having personnel and equipment as required by authorities having personnel and electric

power. Test the entire installation for the short grounds and open circuits correct all defects before acceptance of the work. All work shall be demonstrated to in proper operating condition to the complete satisfaction of the owner. Instruct the Owner's representatives in the case and operation of all apparatus and equipment forming the installation.

3. Guarantees and Instructions:

   a. The Plumbing Contractor shall guarantee all equipment systems and work furnished and installed under the specification for a period of one (1) year from dated substantial completion thereof, against defect in materials design and workmanship.
   b. Failure of any parts during guarantee, owning to above cause, shall be replaced promptly by the sub-contractor upon noted by Architect, without charge to the owner.
   c. Manual: Contractor shall provide the owner the original product manual and warranty certificates.

XXXII. ELECTRICAL WORKS

A. General

1. All work hereunder shall comply with the latest Philippine Electrical Code, the rules and regulations of the Electrical Ordinances of Cagayan de Oro City, the rules and regulations other governing authorities and with Republic Act No. 184 as applied or enforced in Cagayan de Oro City.
2. All work shall comply with the rules and regulations of the Electric Company and the Telephone Company as far as they are concerned in providing their permanent service for use of the said building.
3. Any apparent conflict between the Drawings and Specifications and any controversial or unclear points in either shall be referred to the Project Engineer for final decision.
4. Upon completion of work as described herein six (6) copies if the "As Built" plans for future reference and maintenance purposes, shall be submitted.
5. All materials to be installed shall be unused, brand new and shall conform to the standards of the U.S. Underwriters Laboratories, Inc. in every case where such a standard has been established for the particular type of material to be used.
6. Service Entrance shall 230 V, 3 phases, 3 wires, 60 hertz.
7. ALL TEMPORARY POWER REQUIREMENTS DURING THE CONSTRUCTION SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. This includes the temporary lighting facilities, power requirement for power tools. In the case of civil overtime works, which may require power adjustments or alignments, civil work Foreman shall notify the electrical Contractor for overtime staff.
8. Electrical consumption shall be paid by the Owner.

B. Material Specifications

1. Wires:
   a. Service Entrance- Rigid Steel Conduit
   b. Interior Electrical- Sycwin

2. Raceways:
   a. Feeder-
   b. Auxiliary-
   c. Service Entrance- Rigid Steel Conduit
   d. Mica Tubing on all extended wiring up to 12" only to lighting fixtures only.
   e. Utility Box- PVC deep type Emerald
   f. Square Box- PVC deep type Emerald

g. Octagonal Box- PVC deep type Emerald
h. For PVC rough-in- Emerald

3. Fixtures:

a. Panel Board
   i. Circuit Breaker- ABB Unitized
   ii. Panel Board – ABB Unitized
   iii. Ground Rod: 5/8" dia. Copper.

b. Lighting fixture shall be GES LED.

LOCATIONS	LIGHTING
Lobby/Hallway, Main Electrical Room, Stairs, GenSet Area, Promenade @ Commercial Space, Pump Room, Server Room, Female Toilet, Male Toilet, Electrical Room, Assembly Area, Canopy @ Stairs, Canopy @ Assembly Area, Kitchen @ Conference Room, Toilet @ Medical Clinic, Dental Clinic & Commercial Spaces, Open Court @ Commercial Spaces, Audio Visual Room, Control Room @ AVR, Backstage @AVR, Machine Rooms, Guard Outpost, Storage @ Speech Lab	Downlight 1(DL1) – LER 7WA, COB LED E27 base
All Classrooms	24W LED Tube T8 4FT
Medical Clinic, Dental Clinic, Guidance Coodinator, RSIS(Registrar), Commercials Spaces, All Offices, Conference Room, Saws Office, SSC Office, SCPSEM Office, SCAS Office, SCEA Office, SCIIT Office, VP Student Affairs Office, Sport Development, Arts & Culture, Speech Lab,	Down light 3(DL3) – LED Down light(Tiltable)
MUST Logo	75W LED Floodlight
At Site, Roof of Commercial Spaces	500W LED Floodlight
Landscape @ Second Floor	7W Garden Lamp

4. Control Devices:
   a. Switches: Clipsal Wide series
   b. Convenience Outlet: Clipsal Wide series

C. Workmanship

All works shall be done and executed in accordance with standard engineering method and regulations and with the building and electrical code requirements as cajoled for the design of the project in strict compliance to the plan and specifications.

D. Test

After complete connection and installation of the Owner's equipment, the Electrical Contractor shall test all work and equipment as required by authorities having personnel and equipment as required by authorities having personnel and electric power. Test the entire installation for short ground and open circuits correct all defects before acceptance of the work. All work shall be demonstrated to in proper operating condition to the complete satisfaction the Owner. Instruct the Owner's representatives in the case and operation of all apparatus and equipment forming the installation.

E. Guarantees and Instructions

1. The Electrical Contractor shall guarantee all equipment systems and work furnished and installed under the specification for a period of one (1) year from dated substantial completion therefore, against defect in materials design and workmanship.

2. Failure of any part or parts during the guarantee, owning to above case, shall be replaced promptly by the sub-contractor upon noted by the Architect, without charged by the Owner.

XXXIII. TRANSFORMER

1. Transformer to be used shall have the following Specifications:

   3pcs 200KVA,
   13.2KV/240V, 60Hz,
   1phase Distribution Transformer,
   98.9% efficiency,
   1.5% Voltage Regulation1
   1.1% Excitation Current

XXXIV. GENERATOR SET

1. Install in accordance with Manufacturer's drawings and direction.
2. Product Specifications:
   600 KVA
   Perkins
   4006-23TAG3A
   Standard ElectropaK

Air inlet	-	Mounted air filter
Fuel system	-	Direct fuel injection system, fuel lift pump
	-	Fuel cooler
Governing	-	Heinzmann digital governor – governing to ISO 8528-5 Class G2
Lubrication system	-	Wet sump with filler and dipstick
	-	Lubrication oil filters
	-	Oil cooler with separate filter header
Cooling system	-	Twin thermostats, water pump
	-	System designed for ambient up to 35° C or 50° C
	-	Radiator supplied loose incorporating air-to-air charge cooler
Electrical equipment	-	24 Volt starter motor, 24 Volt 70 Amp battery-charging alternator with integral voltage regulator and activating switch
	-	High coolant temperature switch
	-	Low oil pressure switch
Flywheel and Housing	-	SAE J620 size 18 flywheel
	-	SAE '0' flywheel housing
Literature	-	User's handbook and parts manual
Optional Equipment	-	Heavy-duty air cleaners – paper element with pre-cleaner
	-	Change fuel filter
	-	Immersion heater with thermostat
	-	Additional manuals

- 4 meter wiring harness
- Tropical or temperate radiator kit
- Temperate fan

Fuel Consumption				
Engine Speed	1500 rev/min		1800 rev/min	
	g/kWh	l/hr	g/kWh	l/hr
Standy	212	194	230	224
Prime Power	210	172	226	200
Baseload Power	208	137	213	152
75% of prime power	210	130	214	144
50% of prime power	213	90	205	96

General Data

Number of cylinders	6
Cylinder Arrangement	Vertical-in-line
Cycle	4 stroke
Induction system	Turbocharged and air-to-air charge cooled
Combustion system	Direct injection
Cooling System	Water cooled
Bore and stroke	160 x 190 mm
Displacement	22.921 liters
Compression ratio	13.6:1
Direction of rotation	Anti-clockwise, viewed on flywheel
Firing order	1,5,3,6,2,4
Total lubrication system capacity	113.4 liters
Length	3,027mm
Width	1,706mm
Height	1,964mm
Dry weight (engine)	2,524kg

XXXV. SIGNAL (STRUCTURED CABLING) WORKS

A. General Notes

1. Wirings shall be concealed conduit/ trunking unless otherwise specified.
2. The position of all telco outlets, idf's etc. As shown in the drawings are approximate only. The exact positions shall be determined on site.
3. The contractor shall be responsible for the labeling of all equipment throughout the installation.
4. The contractor shall be responsible to liaise with the local government for all clearances, cable jointing, and testing for the installation.
5. The overall resistance for the earthing system (electrical) shall comply with the latest edition of the Philippine Electrical and Electronics Code.
6. The contractor shall be responsible for sealing of all cable/conduit penetration openings between floor slab and walls etc. With approved fire rating material/sealant.
7. The contractor shall be responsible for the equipotential grounding/all metal parts completed to the nearest bonding to electrical panel.
8. The contractor shall furnish all necessary labor, materials and equipment for satisfactory completion of the entire telecommunication installation as generally described in the specification and/or shown on drawings.

9. All locations of equipment and cable routes shown on the drawing are indicative only. The exact locations must be coordinated on site before installation. Full shop drawings must be submitted to the engineer for approval before commencement of work.
10. Mdf and idf shall be constructed in accordance with the latest edition of philippine electrical/electronics, iea and aics code. They shall be painted with the coat of anti-rust paint and two coats of semi-gloss teak paint of best quality to the approval of the consultant.
11. All the distribution frame conduits which are exposed shall be painted with a coat of rust-resisting primer and two coats of electric orange as specified by the architect.
12. Each circuit shall be tested for grounds and shorts by means of insulation resistance testing instrument applying a voltage of not less than 500v d.c. on circuit under test.
13. The lightning protection system shall comply with the requirements of the latest edition of local electrical/electronics code practice and installed to the satisfaction of the consultant.
14. The contractor liaises to ensure that the power supplies for all equipment are adequately provided to suit the system requirements.
15. All telecommunication outlet, telco equipment, etc., locations shown are indicative only and the electrical contractor must coordinate with the architect and or the interior designer, as well as equipment suppliers.
16. The contractor shall obtain approval from structural engineers for penetration through rc. Beams and floors slabs prior to construction.
17. Testing certificates shall be provided by the contractor prior to the final turn over.
18. All materials/cables to be used and installation method shall comply with the technical specification, standards, code of practice and authority requirement.
19. The contractor is required to submit details of final arrangement and dimensional layout of all items equipment and respective rooms to suit site conditions, etc. For review by the consultant before commencement installation.
20. Engineer in-charge supervising work shall be a duely registered professional electronics engineer as required by R.A. 9292 and the IRR of the revised National Building Code of the Philippines.
21. Listed db gains of amplifier are minimum requirements, contractor to provide additional as required based on actual site condition.

B. Information Outlets (Universal Outlet For Data & Voice)

1. Information outlets shall be category 5e or otherwise stated or existing
2. All electrical/electronics equipment and accessories that are exposed or less than 2.0m away from water sources shall be of water-proof type.
3. Telecommunication outlets etc. Are indicative and approximate.
4. Contractor shall liaise with professional electronics engineer and /consultant on the exact location and mounting heights (if applicable) of outlets, main distribution frame intermediate distribution frame before laying the conduits.
5. Consult designing professional electronics engineers for more details & specifications.

C. CCTV Systems

1. Digital video recording (dvr) must be IP based.
2. Cameras shall be high resolution camera.
3. Cameras shall be installed in ceiling unless otherwise specified in the plan.
4. Ac convenience outlet shall be provided in each camera concealed in ceiling.

XXXVI. FIRE PROTECTION (SPRINKLER, STAND PIPE AND HEAT DETECTOR)

1. For Fire Pump, use "DYNAFLO" end suction centrifugal pump by RCJ, frame mounted, single stage, Model No. 50-20, discharge and suction sizes: 2"- 2 ½", bronze fitted constructed with mechanical seal, capable of delivering 250gpm against 120 psi TDH, driven by an IEC, IP55 electric motor, 40HP, 3450 RPM, 230/460 V, 3 phase, 60 cycles, mounted on a common base with flexible coupling.

2. For Fire Sprinkler use automatic RCJ Fire Sprinkler Pendent, Upright, Side Wall. Pipes shall be B.I. Pipe Schedule 40 LS 11 (American Standard) #4.

3. All works shall comply with the latest provision of the latest edition of the Fire Code of the Philippines and with the rules and regulations of the national and local authorities concerned in the enforcement of fire code law.

4. All works shall be done under the immediate supervision of the dully qualified and competent mechanical engineer.

5. All materials and equipment to be used shall be new ul/fm & nfpa approved type for location and purposes.

6. The fire extinguisher shall be for all purposed fire use as manufactured by competent supplier ul/fm approved.

7. The contractor shall be responsible for securing all government and local construction permits and all required fees.

8. All equipments, fire pumps and accessories shall be ul/fm and nfra 20 approved.

9. Coordinate the drawings with others related drawings and specification. The engineer shall be notified immediately any discrepancies found herein.

10. Work throughout shall be executed in the best and most thorough manner know to trade and to the satisfaction of the owner or engineer in charge.

11. Provide Fire Extinguisher and Exit Signage as required by the Bureau of Fire Protection.

XXXVII. AIR CONDITIONING UNITS

1. Air Conditioning Units shall be:
   1.0 Hp window type, Carrier
   1.5 Hp Hi-wall Xpower Inverter, Carrier
   2.5 Hp Hi-wall Xpower Inverter, Carrier
   3.0 Hp Hi-wall Xpower Inverter, Carrier
   1TOR Floor mounted Xpower Inverter, Carrier
   3TOR Slim Type Floor Mounted, Carrier

2. Install in accordance with Manufacturer's Installation Procedures.

XXXVIII. LANDSCAPING

1. A Tree Removal permit shall be obtained from the office of the MUST President before the removal of existing trees that are to be relocated on site.

2. All areas to be landscaped shall be excavated of all building material and debris to a minimum depth of eighteen (18") inches and back filled with a medium texture planting soil. All areas are to have minimum six (6") inches of topsoil and are to be crowned a minimum six (6") inches higher than adjacent curbs or walks

3. Species to be planted are the following:

   a. Korean Bermuda Grass-covering the entire designated area to be landscaped
   b. Fox Tail Palm
   c. Fukien Tea Topiaries
   d. Variegated Plants
   e. Golden Pandakaki
   f. Dwarf Pandakaki
   g. Golden Miagos
   h. Dwarf Santan
   i.

XXXIX. PAINTING

1. This work includes interior and exterior painting and varnishing and finishing of all items as required producing a finished painting job throughout all of the areas affected by work under this item.

2. Paints and Covering:

A.	Exterior	-Welcoat Acrytile Paint
B.	Masonry	- Welcoat Acrytile Paint
C.	Coating for Steel	-Primer-Epoxy Paints
D.	Striping and Marking for Street Curb and Parking Areas	-Welcoat Rubber Base Traffic Paint

3. All exposed work shall be protected while the building is being painted or varnished. The floors, steps and all other surfaces not to be painted shall be well protected during painting by sufficient covers. Any stains, dirt, smear, etc., shall be removed.

4. Neither paint nor varnish shall be applied on finishes like glazed tiles, glass, plastic, brass, bronze, aluminum, chrome and other non-corrosive metal finishes.

5. All paint materials shall meet the requirements of the Standard Specifications of the Standardization Committee on Supplies and shall be delivered on the site in the original containers, with labels intact and seals unbroken.

6. All paints to be used shall be Acrytile Welcoat Paints or its approved equivalent. Color shall be decided by the Architect.

XL. SITE CLEARING

1. Clean the site and dispose waste after the completion of the Project.

2. Remove all temporary structures erected and clean premises as condition of completing the work.

XLI. PERMITS

1. The MUST shall secure from government agencies all necessary licenses and permits needed.

XLII. MUST SEAL BUILD-UP STAINLESS STEEL COLORED

a. MUST Seal shall be 3 meters in diameter
b. Blue Backing shall be gauge 18 plain stainless steel build-up with anzhal auto-finish paint color navy blue top coat (frontage). 1 ft. thick siding (separate build-up).
c. Text (MINDANAO UNIVERSITY OF SCIENCE AND TECHNOLOGY, Cagayan de Oro City, PHILIPPINES) shall be gauge 18 plain stainless steel build-up text 3d design.
d. Inner design shall be gauge 18 plain stainless steel build-up with anzhal auto-finish paint, color navy blue and egg yellow (separate build-up).
e. Globe design shall be gauge 24 plain stainless steel separate build-up in a protruding half round with stainless build-up of mindanao map shoreline contour.
f. Sun Rays shall be gauge 22 plain stainless steel separate build-up with anzhal paint auto-finish yellow.
g. Green Laurel Leaves and Text (1927) shall be gauge 24 plain stainless steel build-up materials, separate build-up protruding.
h. White Backing shall be gauge 18 plain stainless steel build-up protruding.
i. All colors shall be in accordance with MUST official seal.

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