ISO 9001:2015 CERTIFIED

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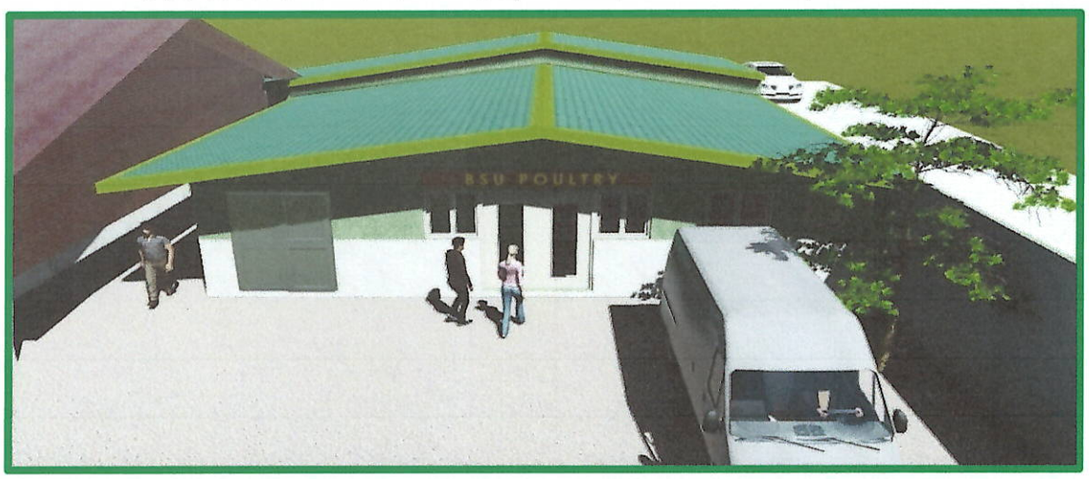
BAGONG PILIPINAS

# TECHNICAL SPECIFICATIONS

## REPAIR OF THE POULTRY OFFICE BUILDING

BSU LA TRINIDAD CAMPUS, BALILI, LA TRINIDAD, BENGUET




**2024**

Name of Project: **REPAIR AND IMPROVEMENT OF THE POULTRY OFFICE BUILDING**
Location: **BALILI, BSU LA TRINIDAD CAMPUS, LA TRINIDAD, BENGUET**

**B.5 - PROJECT BILLBOARD / SIGNBOARD**

B.5.1 Material Requirements:

Tarpaulin

The design and format of the tarpaulin shall have the following specifications:

| | |
|---|---|
| Color | : White |
| Size | : 8 ft. x 8 ft. |
| Resolution | : 70 dpi |
| Font | : Helvetica |
| Font Size of Main Information | : 3 inches |
| Font Size of Sub-Information | : 1 inch |
| Font Color | : Black |
| Suitable Frame | : Rigid wood frame with post; and |
| Posting | : Outside display at the project location after award has been made. |

The information shall contain but not limited to i.) logo of the funding agencies, ii.) the name of implementing agencies, iii.) name of contractor, iv.) project's title, location, cost and description, v.) project details to include duration, date started, target date of completion and project status, and vi.) COA Anti-corruption Hotline.

The display/and or affixture of the picture, image, motto, logo, color motif, initials or other symbol or graphic representation associated with the top leadership of the project proponent or implementing agency/unit/office, on project billboard, is considered unnecessary. (General Guidelines No. 2.2.6)

B.5.2 Post and Frame

Posts and frames/braces shall be made from good lumber with a 2X3 and 2x2 inches size respectively and shall be well-seasoned, straight and free of injurious defects. The frame will be covered with 2 pieces ¼ inch thick marine plywood where the tarpaulin will be attached.

B.5.3 Method of Measurement

The quantities of project billboard shall be in pieces of such signs of the size specified, including the necessary posts and supports erected and accepted.

B.5.4 Basis of Payment

The quantities measured as determined in the Method of Measurement, shall be paid for at the contract unit price for the Pay Items shown in the Bid Schedule which price and payment shall be full compensation for furnishing and installing project billboard, all labor, equipment, tools and incidentals necessary to complete the Item.

Payment will be made under:

| Pay Item No. | Description | Unit of Measurement |
|---|---|---|
| B.5 | Project Billboard / Signboard | Each |

**ITEM B.7 – OCCUPATIONAL SAFETY AND HEALTH PROGRAM**

B.7.1 Description

A Company Safety Policy which shall serve as the general guiding principles in the implementation of safety and health on site duly signed by the highest company official or his duly authorized representative who has the over---all control of project execution and should include the contractor's general policy towards occupational safety, worker's welfare and health, and environment.

A Safety policy, which shall include the commitment that the contractor shall comply with DOLE minimum safety requirements, including reporting requirements of the Occupational Health and Safety Standards (OSHS), and other relevant DOLE issuances. These may include, but are not limited to the following:

Registration (Rule 1020 and DO 18---02)
Report of Safety Committee Organization (Rule 1040)
Notification of Accidents and Occupational Illnesses (Rule 1050)
Annual Work Accident/Illness Exposure Data Report (Rule 1050)
Application for installation of mechanical/electrical equipment for construction of structure for industrial use (Rule 1070 and 1160)
Annual Medical Report (Rule 1960)
*1.2 Specific Construction Safety and Health Program* shall contain the tendering agency's requirements in addition to the minimum requirements under the appropriate sections of D.O. No. 13 whenever deemed as applicable.

B.7.2 Method of Measurement

Payment shall be made on a proportional basis, calculated by multiplying the percentage rate of physical progress to the total lump sum amount every progress billing.

B.7.3 Basis of Payment

Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| B.7 | Occupational Safety and Health Program | Lump Sum |

**ITEM B.9 – MOBILIZATION / DEMOBILIZATION**

B.9.1 Description

This item shall consist of the mobilization and demobilization of equipment needed for the project. In addition, this item also includes the cleaning of the project site including its surroundings before the final inspection.

B.9.2 Method of Measurement

The accepted quantities, measured as prescribed in section B.9.1 shall be paid for at the contract unit price for mobilization / demobilization which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

B.9.3 Basis of Payment

Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|

| | | |
|---|---|---|
| B.9 | MOBILIZATION / DEMOBILIZATION | LUMP SUM |

**ITEM 803(1)a – STRUCTURE EXCAVATION (COMMON SOIL)**

803.1 Description

This Item shall consist of the necessary excavation for foundation of the motor pool, and other structures not otherwise provided for in the Specifications.

It shall also include the furnishing and placing of approved foundation fill material to replace unsuitable material encountered below the foundation elevation of structures.

No allowance will be made for classification of different types of material encountered.

803(1)a.2 Construction Requirements

803(1)a.2.1 Clearing and Grubbing

Prior to starting excavation operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with Item 100, Clearing and Grubbing.

803(1)a.2.2 Excavation

General, all structures. The Contractor shall notify the Engineer sufficiently in advance of the beginning of any excavation so that cross-sectional elevations and measurements may be taken on the undisturbed ground. The natural ground adjacent to the structure shall not be disturbed without permission of the Engineer.

Trenches or foundation pits for structures or structure footings shall be excavated to the lines and grades or elevations shown on the Plans or as staked by the Engineer. They shall be of sufficient size to permit the placing of structures or structure footings of the full width and length shown in the Structural Plan under Footing Schedule. The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary, to secure a satisfactory foundation.

Trenches or foundation pits for structures or structure footings shall be excavated to the lines and grades or elevations shown on the Plans or as staked by the Engineer. They shall be of sufficient size to permit the placing of structures or structure footings of the full width and length shown. The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary, to secure a satisfactory foundation.

803(1)a.2.3 Utilization of Excavated Materials

All excavated materials, so far as suitable, shall be utilized as backfill or embankment. The surplus materials shall be disposed off in such manner as not to obstruct the stream or otherwise impair the efficiency or appearance of the Structure. No excavated materials shall be deposited at any time so as to endanger the partly finished structure.

803(1)a.3 Method of Measurement

The volume of excavation to be paid for will be the number of cubic meters measured in original position of material acceptably excavated in conformity with the Plans or as directed by the Engineer:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 803(1)a | STRUCTURE EXCAVATION (COMMON SOIL) | Cu.m. |

**ITEM 804 – EMBANKMENT (BACKFILL FROM STRUCTURE EXCAVATION)**

804(1)a.1 Description

This Item shall consist of the backfilling of the excavated footings and preparation of base materials for the slab-on-fill as indicated in the plan and specification.

It shall also include the furnishing and placing of approved foundation fill material to replace unsuitable material encountered below the foundation elevation of structures.

804(1)a.2 Construction Requirements

Embankment for the base of the slab-on-fill of earth material shall be placed in horizontal layers not exceeding *200 mm (8 inches)*, loose measurement, and shall be compacted as specified before the next layer is placed. However, thicker layer maybe placed if vibratory roller with high compactive effort is used provided that density requirement is attained and as approved by the Engineer. Trial section to this effect must be conducted and approved by the Engineer. Effective spreading equipment shall be used on each lift to obtain uniform thickness as determined in the trial section prior to compaction. As the compaction of each layer progresses, continuous leveling and manipulating will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density. Removal of water shall be accomplished through aeration by plowing, blading, discing, or other methods satisfactory to the Engineer.

Throughout the periods when compaction of earthwork is in progress, the Contractor shall adhere to the compaction procedures found from compaction trials for each type of material being compacted, each type of compaction equipment employed and each degree of compaction specified.

804(1)a.3 Method of Measurement

The volume of embankment (Backfill from Structure Excavation) to be paid for will be the number of cubic meters measured in original position of material acceptably backfilled and compacted in conformity with the Plans or as directed by the Engineer:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 804(1)a | EMBANKMENT (BACKFILL FROM STRUCTURE EXCAVATION) | Cu.m. |

**ITEM 804(4) – GRAVEL BEDDING**

804(4).1 Description

This Item shall consist of placing and compacting of gravel bedding materials for the footing and slab-on-fill as indicated in the plan and specification.

It shall also include the furnishing and placing of approved foundation fill material to replace unsuitable material encountered below the foundation elevation of structures.

804(4). 2 Material and Construction Requirements

Materials for this item is a G1 Gravel as indicated in the DUPA for this item.

Throughout the periods when compaction of gravel fill is in progress, the contractor shall adhere to the compaction procedures found from compaction trials for each type of material being compacted, each type of compaction equipment employed and each degree of compaction specified.

804(4). 3 Method of Measurement

The volume of G1 gravel bedding of footings and slab on fill to be paid for will be the number of cubic meters measured in original position of material acceptably of compacted gravel in conformity with the Plans or as directed by the Engineer:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 804(4) | GRAVEL BEDDING | Cu.m. |

**ITEM 900(7) - REINFORCED CONCRETE (3500 PSI @ 28 DAYS)**

900(7).1 Description

This Item shall consist of furnishing, placing and finishing concrete in buildings and related structures in accordance with this specification and conforming to the lines, grades, and dimension shown on the plans.

900(7).2 Materials Requirements

900(7).2.1 Portland Cement

This shall conform to the requirement of ITEM 700, Volume II (Blue Book), Hydraulic cement.

900(7).2.2 Concrete Aggregates

Concrete aggregate shall conform to the requirements of subsection 311.2.2 and 311.2.3 under Item 311 of Volume II, (Blue Book) and ASTM C 33 for lightweight aggregates, except that aggregates failing to meet these specifications but which have been shown by special that or actual service to produce concrete of adequate strength and durability may be used under method (2) of determining the proportion of concrete, where authorized by the Engineer.

Except as permitted elsewhere in this section, the maximum size of the aggregate shall be not larger than one-fifth (1/5) of the narrowest dimensions between sides of forms of the member for which the concrete is to be used nor larger than three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars or pretensioning strands.

900(7).2.2.1 Aggregate Tests

Samples of the fine and coarse aggregates to be used shall be selected by the Engineer for tests at least 30 days before the actual concreting operations are to begin. It shall be the responsibility of the contractor to designate the source or sources of aggregate to give the Engineer sufficient time to obtain the necessary samples and submit them for testing.

No aggregate shall be used until official advice has been received that it has satisfactorily passed all test, at which time written authority shall be given 'for its use.

900(7).2.3 Water

Water used in mixing concrete shall conform to the requirement of subsection 311.2.4 under Item 311, Part E, of Volume II, (BlueBook).

900(7).2.4 Metal Reinforcement

Reinforcing steel bars shall conform to the requirements of the following Specifications:

| | |
|---|---|
| Deformed & Plain Billet Steel Bars for concrete Reinforcement | (ASTM A 615) |
| Bars for concrete Reinforcement | AASHTO M 31 |
| Deformed Rail - Steel and Plain | |
| Bars for Concrete Reinforcement | ASTM A 616 |
| Deformed A x b - Steel and Plain | |
| Bars for Concrete Reinforcement | ASTM A 617 |

If reinforcing bars are to be welded, these ASTM specifications shall be supplemented by requirements assuring satisfactory weldability.

| | |
|---|---|
| Bar and rod mats for concrete reinforcement | ASTM A 187 |
| Cold-Drawn Steel Wire for concrete reinforcement | (ASTM A 82) |
| | AASHTO M 32 |
| Welded steel wire fabric for concrete reinforcement except that | (ASTM A 185) |
| the weld shear strength requirement of those specification shall | AASHTO M55 |
| be extended to include a wire size differential up to and including | |
| six gages. | |
| Wire and Strands for prestressed concrete | ASTM A 416 |
| | ASTM A 421 |

Used in making strands for post-tensioning shall be cold- drawn and either stress-relieved in the case of uncoated strands, or hot dip galvanized in the case of galvanized strands.

High strength alloy steel bar for post- tensioning shall be proof stressed to 90 % of the granted tensile strength. After proof stressing, the bars shall conform to the following minimum properties:

| | |
|---|---|
| Tensile strength fs' | 1000 MPa |
| Yield strength (0.2 offset) | 0.90 fs' |
| Elongation at rupture in 20 diameter | 4 percent |
| Reduction of area at rupture | 25 percen |
| Structural steel | ASTM A 36 |
| Steel Pipe for concrete-filled pipe column | ASTM A 53 |
| Cast-Iron Pipe for composite columns | ASTM A 377 |

900(7).2.5 Admixtures

Air-entraining admixtures, if used, shall conform to ASTM C 260.

Water-reducing admixtures, retarding ad- mixtures, water-reducing and retarding admixtures and water reducing and accelerating admixtures, if used, shall conform to the requirements of ASTM C 494.

900(7).2.6 Storage of Materials

Cement and aggregates shall be stored in such a manner as to prevent their deterioration or the intrusion of foreign matter. Cement shall be stored, immediately upon arrival on the site of the work, in substantial, waterproof bodegas, with a floor raised from the ground sufficiently high to be free from dampness. Aggregates shall be stored in such a manner as to avoid the inclusion of foreign materials.

900(7).3 Construction Requirements

Notations: The notations used in these regulations are defined as follows:

f'c = compressive strength of concrete

Fsp = ratio of splitting tensile strength to square root of compressive strength.

900(7).3.1 Concrete Quality

All plans submitted for approval or used for any project shall clearly show the specified strength, fc', of concrete of the specified age for which each part of the structure was designed.

Concrete that will be exposed to sulfate containing or other chemically aggressive solutions shall be proportioned in accordance with "Recommended Practice for Selecting Proportions for Concrete (ACI 613)" and Recommended Practice for Selecting Proportions for Structural Lightweight Concrete (ACI 613A)."

900.3.2 Methods of Determining the Proportions of Concrete

The determination of the proportions of cement, aggregate, and water to attain the required strengths shall be made by one of the following methods, but lower water-cement ratios may be required for conformance with the quality of concrete.

Method 1, Without preliminary test

Where preliminary test data on the materials to be used in the concrete have not been obtained the water-cement ratio for a given strength of concrete shall not exceed the values shown in Table 900.1.' When strengths- in excess bf 281 kilograms per square centimeter (4000 pounds per square inch) are required or when light weight aggregates or' admixtures (other than those exclusively for the purpose of entraining - air) are used, the required water-cement ratio shall be determined in accordance with Method 2.

Method 2. For combination of materials previously evaluated or to be established by trial mixtures.

Water-cement ratios for strengths greater than that shown in Table I 900(7).1 may be used provided that the relationship between strength and I water-cement ratio for the materials to be used has been previously established by reliable test data and the resulting concrete satisfies the requirements of concrete quality. Where previous data are not available. Concrete trial mixtures having proportions and consistency suitable for the work shall be made using at least three different water-cement ratios (or cement content in I the case of lightweight aggregates) which will produce a range of strengths encompassing those required for the work. For each water-cement ratio (or cement content) at least three specimens for each age to be tested shall be made, cured and tested for strength in accordance with ASTM C 39 and C 192.

The strength test shall be made at 7, 14 and 28 days at which the concrete is to receive load, as indicated on the plans. A curve shall be established showing the relationship between water-cement ratio (or cement content) and compressive strength. The maximum permissible water-cement ratio for the concrete to be used in the structure shall be that shown by the curve to produce an average strength to satisfy the requirements of the strength test of concrete provided that the water-cement ratio shall be no' greater than that required by concrete quality when concrete that is to be subjected to the freezing temperatures which weight shall have a water-cement ratio not exceeding 6 gal per bag and it shall contain entrained air.

Where different materials are to be used for different portions of the work, each combination shall be evaluated separately.

TABLE 900(7).1 MAXIMUM PERMISSIBLE WATER-CEMENT RATIOS FOR CONCRETE (METHOD NO.1)

| Specified compressive strength at 28 days, psi fc | Maximum permissible water-cement ratio | | | |
|---|---|---|---|---|
| | Non air-entrained concrete | | Air-entrained concrete | |
| | U.S. gal. per 42.6 kg. bag of cement | Absolute ratio by weight | U.S. gal per 42.6 kg. bag of cement | Absolute ratio by weight |
| 2500 | 7 ¼ | 0.642 | 6 ¼ | 0.554 |
| 3000 | 6 ½ | 0.576 | 5 ¼ | 0.465 |
| 3500 | 5 ¾ | 0.510 | 4 ½ | 0.399 |
| 4000 | 5 | 0.443 | 4 | 0.354 |

900(7).3.3 Concrete Proportions and Consistency

The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the form and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work.

900(7).3.4 Sampling and Testing of Structural Concrete

As work progress, at least one (1) set of samples consisting of three (3) concrete cylinder test specimens, 150 x 300 mm shall be taken from each class of concrete placed each day, and each set to represent not more than 75 cu m of concrete.

900(7).3.5 Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be such a consistency that it will flow around reinforcing steel but individual particles of the coarse aggregate when isolated shall show a coating or mortar containing its proportionate amount of sand. The consistency of concrete shall be gauged by the ability of the equipment to properly place it and not by the difficulty of mixing water shall be determined by the Engineer and shall not be varied without his consent. Concrete as dry as it is practical to place with the equipment specified shall be used.

900(7).3.6 Strength Test of Concrete

When strength is a basis for acceptance, each class of concrete shall be represented by at least five test (10 specimens). Two specimens shall be made for each test at a given age, and not less than one test shall be made for each 150 cu yd of structural concrete, but there shall be at least one test for each days concreting. The Building Official may require a reasonable number of additional tests during the progress of the work. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C 172. Specimens made to check the adequacy of the proportions for strength of concrete or as a basis for acceptance of concrete shall be made and laboratory-cured in accordance with ASTM C 31. Additional test specimens cured entirely under field conditions may be required by the Building Official to check the adequacy of curing and protection of the concrete. Strength tests shall be made in accordance with ASTM C 39.

The age for strength tests shall be 28 days of, where specified, the earlier age at which the concrete is to receive its full load or maximum j stress. Additional test may be made at earlier ages to obtain advance information on the adequacy of strength development where age-strength relationships have been established for the materials and proportions used.

To conform to the requirements of this Item:

1) For structures designed in accordance with the working stress design method of this chapter, the average of any five consecutive strength tests of the laboratory-cured specimens representing each class of concrete shall be equal on or greater than the specified strength, fc', and not more than 20 percent of the strength test shall have values less than that specified.
2) For structures designed in accordance with the ultimate strength design method of this chapter, and for prestressed structures the average of any three consecutive strength test of the laboratory, cured specimens representing each class of concrete shall be equal to or greater than the specified strength, fc' and not more than 10 percent of the strength tests shall have values less than the specified strength. When it appears that the laboratory-cured specimens will fail to conform to the requirements for strength, the Engineer shall have the right to order changes in the concrete sufficient to increase the strength to meet these requirements. The strengths of the specimens cured on the job are intended to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When, in the opinion of the Building Official, the strengths of the job-cured specimens, the contractor may be required to improve the procedures for protecting and curing the concrete, or when test of field-cured cylinders indicate deficiencies in protection and curing, the Engineer may require test in accordance with ASTM

Specification C 42 or order load tests as outlined in the load tests of structures for that portion of the structure where the questionable concrete has been placed.

900(7).3.7 Splitting Tensile Test of Concrete
To determine the splitting ratio, Fsp, for a particular aggregate, test of concrete shall be made as follows:

1. Twenty-four (24) 15 cm. dia. by 30 cm long (6 in. dia. by 12 in. long) cylinders shall be made in accordance with ASTM C 192, twelve at a compressive strength level of approximately 210 kilograms per square centimeter (3000 psi) and twelve at approximately 280 kilograms per square centimeter (4000 psi) or 350 kilograms per square centimeter (5000 psi). After 7 days moist curing followed by 21 days drying at 23C (73F) and 50 percent relative humidity, eight of the test cylinders at each of the two strength levels shall be tested for splitting strength and four for compressive strength.

2. The splitting tensile strength shall be determined in accordance with ASTM C 496, and compressive strength in accordance with ASTM C 39. The ratio, Fsp, of splitting tensile strength to the square root of compressive strength shall be obtained by using the average of all 16 splitting tensile test and all 8 compressive tests. Minimum Strength, Concrete other than fill, shall have a minimum compressive strength at 28 days of 140 kilograms per square centimeter (2000 psi).

900(7).3.8 Batching
Batching shall conform to the requirements of Item 405, Structural Concrete.

900(7).3.9 Mixing and Delivery
Mixing and delivery shall conform to the requirements of Item 405, Structural Concrete.

900(7).4 Concrete Surface Finishing: General
This shall be in accordance with Item 407, Concrete Structures.

900(7).5 Curing Concrete (See subsection 407)

900(7).6 Acceptance of Concrete
The strength of concrete shall be deemed acceptable if the average of 3 consecutive strength test results is equal to or exceed the specified strength and no individual test result falls below the specified strength by more than 15 %.
Concrete deemed to be not acceptable using the above criteria may be rejected unless contractor can provide evidence, by means of core tests, that the quality of concrete represented by the failed test result is acceptable in place. Three (3) cores shall be obtained from the affected area and cured and tested in accordance with AASHTO T24.
Concrete in the area represented by the cores will be deemed acceptable if the average of cores is equal to or at least 85 % and no sample core is less than 75 % of the specified strength otherwise it shall be rejected.

900(7).7 Method of Measurement
The quantity of concrete to be paid shall be the quantity shown in the Bid Schedule, unless changes in design are made in which case the quantity shown in the Bid Schedule will be adjusted by the amount of the change for the purpose of payment. No deduction will be made for the volume occupied by the pipe less than 101 mm (4") in diameter nor for reinforcing steel anchors, weep holes or expansion materials.

900(7).8 Basis of Payment
The accepted quantities of gravel bedding completed in place will be paid for at the contract unit price for cubic meter as indicated on the Bid Schedule.

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 900(7) | REINFORCED CONCRETE (3000 PSI @ 28 DAYS) | Cu.m. |

Such prices and payment shall be full compensation for furnishing all materials, including metal water stops, joints, joint fillers, weep holes, and rock backing and timber bumpers; for all form and false work; for mixing, placing, furnishing, and curing the concrete; and for all labor, materials, equipment, tools and incidentals necessary to complete the item, except that reinforcing steel shall be paid for at the contract unit price per kilogram for reinforcing steel metal pipes and drains, metal conduits and ducts, and metal expansion angles shall be paid for as structural steel that when the proposal does not include an item for structural steel these miscellaneous metal parts shall be paid for as reinforcing steel.

**ITEM 1046(2)a1 – CHB NON LOAD BEARING, 100mm (INCLUDING REINFORCING STEEL)**
1046(2)a1.1 Description

This item shall consist of the laying of CHB including concrete mortar fill and reinforcing bars to the proposed Motorpool.

1046(2)a1.2 Method of Measurement
The accepted quantities, measured as prescribed in section 1046(2)a1.1 shall be paid for at the contract unit price for the laying of CHB including concrete mortar fill and reinforcing bars which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.
1046(2)a1.3 Basis of Payment
Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1046(2)a1 | CHB NON LOAD BEARING, 100mm (INCLUDING REINFORCING STEEL) | SQ.M. |

**ITEM 1027(1) – CEMENT PLASTER FINISH**
1027(1). 1 Description
This item shall consist of furnishing all cement plaster materials, labor, tools and equipment required in undertaking cement plaster finish as shown on the Plans and in accordance with this specification.

1027(1). 2 Material Requirements
Manufactured materials shall be delivered in the manufacture's original unbroken packages or containers which are labelled plainly with the manufacture's name and trademark.
1027(1). 2.1 Cement
Portland cement shall conform to the requirements as defined in item 700, Hydraulic Cement.
1027(1). 2.2 Hydrated Lime
Hydrated lime shall conform to the requirements as defined in item 701, Hydrated Lime.
1027(1). 2.3 Fine Aggregates
Fine aggregate shall be clean, washed sharp river sand and free from dirt, clay, organic matter or other deleterious substance. Sand derived from crushed gravel or stone may be used with the Engineer's approval but in no case shall such sand be derived from stone unsuitable for use as coarse aggregates.

1027(1). 3 Construction Requirements
1027(1). 3.1 Mixture

a) Mortar mixture for brown coat shall be freshly prepared and uniformly mixed in the proportion by volume of one part Portland Cement, three (3) parts sand and one fourth (1/4) part hydrated lime.
b) Finish coat shall be pure Portland Cement properly graded conforming to the requirements of item 700, Hydraulic Cement and mixed with water to approved consistency and plasticity.

1027(1). 3.2 Surface Preparation

a) After removals of formworks reinforce concrete surfaces shall be roughened to improve adhesion of cement plaster.
b) Surfaces to receive cement plaster shall be cleaned of all projections, dust, loose particles, grease and bond breakers. Before any application of brown coat is commenced all surfaces that are to be plastered shall be wetted thoroughly with clean water to produce a uniformly moist condition.

1027(1). 3.3 Application

a) Brown coat mortar mix shall be applied with sufficient pressure starting from the lower portion of the surface to fill the grooved and to prevent air pockets in the reinforced concrete / masonry work and avoid mortar mix drooping. The brown coat shall be lightly broomed/ or scratch before surface had properly set and allowed to cure.
b) Finish coat shall not be applied until after the brown coat has seasoned for seven days and corrective measures had been done by the contractor on surfaces that are defective. Just before the application of the finish coat, the brown coat surface shall be evenly moistened with potable water. Finish coat shall be floated first to a tue and even surface, then troweled in a manner that will force the mixture to penetrate into the brown coat. Surface applied with finish coat shall then be smooth with paper in circular motion to remove trowel marks, checks and blemishes. All cement plaster finish shall be 10mm thick minimum on vertical concrete and/or masonry walls.

Wherever indicated on the plans to be "Simulated Red Brick Finish", the contractor shall render brick design on plaster surface before brown coat had properly set and then allowed to dry. Cement plaster shall not be applied directly to:

a) Concrete or masonry surface that had been coated with bituminous compound and,
b) Surfaces that had been painted and previously plastered.

1027(1). 3.4 Workmanship
Cement plaster finish shall be true to details and plumed. Finish surface shall have no visible junction marks where one (1) day's work adjoins the other. Where directed by the Engineer or as shown on the plans vertical and horizontal groove joints shall be 25 mm wide and 10 mm deep.

1027(1). 4 Method of Measurement
All cement plaster finish shall be measures in square meters or part thereof for work actually completed in the building.

1027(1). 5 Basis of Payment
The work quantified and determined as provided in the Bill of Quantities shall be paid for at the contract unit price which price constitutes full compensation including labor, materials, tools and equipment and incidentals necessary to complete this item.
Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1027(1) | CEMENT PLASTER FINISH | SQ.M. |

**ITEM 1021(1)a - CEMENT FLOOR FINISH (PLAIN)**
1021(1)a.1 Description
This Item shall consist of furnishing all materials, labor, tools and equipment in undertaking cement floor finishing where shown on the Plans and in accordance with this Specification.

1021(1)a.2 Material Requirements
Manufactured materials shall be delivered in the manufacturer's original unbroken packages or containers which are labeled plainly with the manufacturer's name and trademark.

1021(1)a.2.1 Cement
Portland cement shall conform to the requirement of Item 700, Hydraulic Cement.

1021(1)a.2.2 Fine Aggregates
Fine aggregates shall be clean, washed, Sharp River sand and free from dirt, clay, organic matter or other deleterious substances. Sand derived from crushed gravel or stone may be used with the Engineer's approval but in no case shall such sand be derived from stone unsuitable for use as coarse aggregate.

1021(1)a.2.3 Coloring Material
The coloring material shall be red or green oxide powder of the quality capable of achieving the best staining power and homogeneity.
1021(1)a.2.4 Metallic Floor Hardener (Premix)
Metallic floor hardener shall be a mixture of oil-free specially graded clean iron particles, mineral oxide pigment and Portland cement binder, premixed according to the manufacturer's instruction manual.

Non-Metallic Floor Hardener
a) Powder type hardener shall be silica quartz aggregates, workability admixtures, mineral oxide pigments and Portland cement mixed according to the manufacturer's instruction manual.
b) Epoxy type topping hardener shall be a combination of epoxy resins filled with hard and natural emery or silica quartz aggregates, premixed according to the manufacturer's instruction manual.

1021(1)a.3 Construction Requirements
1021(1)a.3.1 Mixture
Concrete topping materials shall be measured accurately in accordance with the following:
a) Mortar topping shall be one (1) part Portland cement and three (3) parts fine aggregate by loose volume.
b) Finish topping shall be pure Portland cement properly graded conforming to the requirements of Item 700, Hydraulic Cement, mixed with water to approved consistency and plasticity. Where required to be colored cement floor finish, red or green oxide powder shall be premixed with Portland cement complying with finish topping requirements and the desired color intensity. Cement floor finish floor hardener shall be premixed as required and applied in accordance with the manufacturer's instruction manual.

1021(1)a.3.2 Preparation of Concrete Surface
Surface to receive mortar concrete topping shall be cleaned of all projections, dust, loose particles and other foreign matters.

Finish elevation shall be established over the areas indicated on the Plans.

1021(1)a.3.3 Application
Before any mortar concrete topping is applied, the prepared concrete base surface shall first be wetted and grouted with Portland cement.
a) Mortar topping of the thickness specified on the Plans, shall be spread over the prepared concrete base and shall be float finished using wood hand trowel. Batches of mortar topping shall be emplaced within one hour of mixing thereof.
b) As soon as the water sheen has disappeared the surface shall be lightly scratched with a stiff bristle broom
c) The finish topping mixture whether plain, colored, or with floor hardener shall be spread over the lightly scratched surface before final set taken place and hand troweled to produce a smooth surface.
d) The finished surface shall be free of trowel marks, have uniform texture and true to a plane within an allowable tolerance of 3 mm in 3.0 meters.

1021(1)a.3.4 Protection of Finished Surface
Cement floor finished surface shall be covered with burlap or appropriate covering to avoid injurious action by sun, rain, flowing water and mechanical injury.

1021(1)a.3.5 Workmanship
Cement floor shall be finished level and true to finish elevation as shown on the Plans Finish topping shall have no visible junction marks where one (1) day's work adjoins the other. V-cut groove lines shall be provided where shown on the Plans or as directed by the Engineer.

1021(1)a.4 Method of Measurement
All cement floor finish shall be measured in square meters or part thereof tor work actually completed and accepted.

1021(1)a.5 Basis of Payment
The work actually completed and accepted as measured in square meters shall be paid for at the Unit Price or contract price which price constitute full compensation including labor, materials, tools and incidentals necessary to complete this Item.
Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1021(1)a | CEMENT FLOOR FINISH (PLAIN) | SQ.M. |

**ITEM 1003 - METAL STUD DRYWALL**
1003.1 Description of Work
The work under this Item shall consist of furnish all labor, materials and equipment necessary to complete entire metal stud partition system as indicated on the Drawings and finish schedule and herein specified.

1003.2 Material Requirements
1003.2.1 Materials

A. Studs shall be 3-5/8 in. wide metal "C" studs, roll-formed from 20-gage galvanized steel, designed for screw attachment, in lengths indicated on the drawings.
   1. Studs shall not be spliced, but shall be transported to the partition location in lengths shown on the Drawings.
   2. Contractor shall submit method of how to get the studs into the basement, for approval by the Engineer, since basement access is limited.
B. Bottom runner and ceiling track shall be metal runners formed of galvanized steel, and in sizes to correspond with the studs. Ceiling tracks shall be galvanized steel, with slotted vertical holes, to allow deflection of the ceiling above, as the floor above takes live load.
C. Metal studs, runners, tracks, and all framing, shall be all from one manufacturer.
   1. Acceptable manufacturers: Marino \ WARE, LLC, South Plainfield, NJ 07080, or equal.
D. Wallboard shall have eased radial edges specially designed to overcome joint deformation, shall comply with Federal Specifications SS1-30c and ASTM C36 , and shall be:
E. Wallboard sealant shall be sheetrock Brand W/R sealant.
F. Fasteners, for wallboard shall be 7/8 in. Brand HI-LO type S Bugle Head Screws.
G. Fasteners, for stud to runner shall be 3/8 in. Brand Type S Fan Head Screws.
H. Fasteners, for stud to door frame shall be 1/2-inch Brand Type S-12 Fan Head Screws.
I. Metal trim shall be galvanized, of sizes corresponding with the wallboard thickness and types as detailed on the drawings.
J. Caulking shall be a resilient, non-hardening, non- shrinking, non-skinning, non-straining material.

1003.2.2 Anchorage of Framing to Concrete and Grouted Masonry

A. Steel framing shall be secured to concrete and grouted masonry as shown on the Drawings.
   1. Anchors shall be ITW Buildex "Tapcon" Concrete Screws, or equal. Install in strict accordance with manufacturer's printed instructions.

1003.3 Installation

A. Metal runners shall be aligned accurately according to partition layouts and secured to perimeter surfaces as shown on the Drawings.
B. Metals studs shall be placed as spacing shown on the Drawings. All studs shall span full height, in one piece, with no splices. Pipe or conduit chases may be provided by cutting round holes in the center of the stud web, spaced at least 12 in. apart, and no larger than 75% of the stud width.
C. Unless shown otherwise on the Drawings, metal door frame studs shall be located within 2 in. of all door-frame jambs and shall be anchored to the jamb and head anchor clips of each frame by bolt or screw attachment.
D. All metal door frames shall be spot grouted at the jamb anchor clips, after the stud and before the gypsum wallboard is installed.
E. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8 in. from ends or edges of wallboard to provide uniform dimple not over 1/32 in. deep.
F. Vertical wallboard shall be fastened to web of corner runner and flange of ceiling runner with 1-inch screws spaced 12 in. o.c. Studs shall be inserted between corner runner and wall runner. Alternate studs shall be attached to runners with USG Metal Lock Fastener Tool. Bottom wallboard shall be attached to studs and runners with 1-in. screws spaced 12 in. o.c. Screws in the corner runner shall be located at least 1-in. from the edge of the wallboard.
G. Accessories
   1. Corner beads shall be installed on all exterior corners, attached with suitable fasteners spaced 9 in. o.c. on both sides, and shall be in single lengths unless corner length exceeds standard stock lengths.
   2. Control joints shall be installed where indicated, and as detailed, on the Drawings.
   3. See Drawings for any other accessories.

H. Joint treatment compounds shall be mixed according to manufacturer's directions.

1. Pre-filling

All "V" grooves formed by abutting eased radial edges of wallboard shall be filled flush with the plane of the taper with pre-fill compound. Excess compound beyond the "V" groove shall be wiped clean leaving a flat joint to receive the taping.

2. Taping

After pre-fill has hardened, a thin, uniform layer of taping compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

3. Filling

After taping compound has hardened, topping compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least 4 in. on either side of the tape. No fill coat is necessary on interior angles.

4. Finishing

After topping compound is set, a finishing coat of topping compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for decoration.

I. Fastener Depressions

Taping compound shall be applied to all fastener depressions followed, when hardened, by at least two coats of topping compound, leaving all depressions level with the plane of the surface.

J. Finishing Beads and Trim

Taping compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two coats of topping compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

1003.4 Cleaning

At the completion of installation of the partitions, all rubbish shall be removed from the building, leaving floors broom clean. Excess material, scaffolding, tools, and other equipment shall be removed from the building and job site.

1003.5 Basis of Payment

Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1003 | METAL STUD DRYWALL | SQ.M. |

**ITEM SPL. 3 – ALUMINUM FRAMED GLASS WINDOWS**

SPL.3.1 Description

This Item shall consist of all fabricated steel windows fully equipped with fixing accessories and locking devices as shown on the Plans and in accordance with this Specification.

SPL.3.2 Material Requirements

All members shall be of hot-rolled, low carbon, new billet steel, heavy section with depth of at least 33mm and web thickness of at least 3mm. Frame members shall be of equal leg design section only at points where called for or shown on detailed drawings. Continuous angle fins, as indicated shall be furnished. Zee type section of special design with offset permitting down turned leg of the ventilator member to seat flush when ventilator is in a fully closed position, shall be used for frame at sills. Ventilator members shall be special angle shape. Frames of ventilator members shall have integral weather baffles providing double flat parallel weathering contacts of not less than 6mm width on all four sides of the ventilator. Muntin's shall be 25mm by 25mm rolled-tee sections. All members to be used shall conform to the specification requirements of ASTM A "505. The frame member shall afford not less than 16mm continuous anchorage to surrounding masonry. Unless otherwise specified/or indicated on Plan as residential casement, special size of section shall be used.

SPL.3.2.1 Residential Casement

Sections shall be hot rolled new billet steel special design. Frame and ventilator members shall be specially designed zee sections, not less than 25 mm in depth and not less than 3 mm in thickness, with weathering baffles rolled integrally to provide continuous double contact between frame and casement ventilator members. Muntin's shall be 19mm by 19 mm rolled tee-sections. Side hung hinges shall be of extension friction type welded to both frame and ventilator with friction washers and steel acorn-nuts.

SPL.3.2.2 Heavy Duty Side-hinged Ventilator

Frame and ventilator members shall be specially designed zee section not less than 33 mm in depth and not less than 3 mm in thickness, with weathering baffles rolled integrally to provide continuous double contact between frame and side-hinged ventilator members. Muntin shall be 25 mm by 25 mm rolled tee-sections. Simplex-type hinges shall be of extension friction type with bronze friction washers and rust proofed steel acorn-nuts., hinged design shall provide ferrous to non ferrous contacts between all movable surfaces. Hinges shall be welded to both frame and ventilator.

SPL.3.2.3 Projected Ventilators

All members shall be hot rolled new billet steel window. Frames and ventilator sections shall be special angle shape and not less than 33 mm deep from front to back not less than 3 mm in thickness. Weathering projections, overlapping, parallel contacts at both insides and outside points of closure on all four sides of the ventilator shall be 6 mm.

SPL.3.2.4 Awning ventilators (for series of ventilators operating simultaneously)

Frame, ventilator and muntin members shall be hot rolled new billet steel section not less than 33 mm deep, specifically designed for steel windows.

SPL.3.3 Construction Requirements

SPL.3.3.1 Fabrication and Welds

Corners of frame and ventilator shall be mitered and electrically butt welded with exposed welds ground smooth. Head drips shall be provided where ventilator extend to the top of the windows. Muntin's shall be welded to frames. Muntin intersections shall be welded with flush interior surfaces

SPL.3.3.2 Hardware (fixing accessories and locking devices)

SPL.3.3.2.1 Residential Casement, heavy duty side-hinged ventilator

a) Roto Type: Each ventilator shall be hung on two heavy hot rolled steel of the extension type, welded to both frame and ventilator. Hinged design shall provide ferrous to nonferrous to non ferrous contacts between all movable surfaces. Hardware shall control ventilator independently of the screen and shall consist of a polished bronze locking handle and worn drive operator. Provide however that roto hardware shall not be used on

any ventilator, the size of which exceeds 1 square meter in area. Ventilators over 150 mm in height shall have three (3) hinges and double locking device.

b) Simplex-Type: Hinges shall be of extension friction type with bronze friction washers and rust proofed steel acorn-nuts. Hinged design shall provide ferrous to non ferrous contacts between all movable surfaces. Hinges shall be welded to both frame and ventilator.

c) Polished bronze locking handle and strike shall be furnished for ventilator 500 mm and under in height, two point locking devices and three (3) hinges for ventilators over 500 mm in height. Sill adjuster shall be provided for ventilator over 1000 mm square meter in area.

SPL.3.3.2.2 Projected Ventilators
Each ventilator shall be balanced on two heavy steel arms riveted to ventilator -and frame. Rivet holes in arms shall be bronze bushed. Uniform tension to hold ventilator in open position shall be obtained by two heavy bronze, sliding friction shoes with adjustable compression springs enclosed in bronze housing attached to the ventilator top rail member. The window frame member shall act as a guide for the friction shoe. Hardware shall consist of polished bronze pole hook ring, cam handle and strike for outward projecting ventilators. Polished bronze, pole operated spring latches, shall be substituted for locking handles on outward projecting ventilator, out of each floor, polished bronze, cord operated, spring latches for inward projecting vents not within reach of floor provided with double line of best quality sash cord 5 mm to 6 mm in diameter extending to 762 mm above floor. Polished bronze, under screen push bar working through the member to be furnished for outward projecting ventilator when so indicated on Plans or drawings.

SPL.3.3.2.3 Awning Ventilators
Each awning window so indicated on the Plans shall be of the awning type window in which the ventilators operate simultaneously and controlled manually. Each projecting ventilator shall be balanced on two heavy steel supporting arms. Arms for upper ventilators shall have tops pivots enclosed in malleable iron housing riveted to ventilator and pivoting point shall be located outside of window to provide efficient leverage. Ventilator in each window shall be equipped with extension arms attached to connecting steel frame and shall be concealed within frame when ventilators are in closed position. All ventilators shall open or close simultaneously. The bottom ventilator shall be the means of control and shall be fitted with a solid bronze, polished, cam locking handle and strike. Base of handle to dowel with strike to prevent side motion of ventilator. Where windows are screened, provide a bronze under screen push bar working thru the frame member.

SPL.3.3.3 Installation
All steel windows shall be set plumb and true in openings. The joints between the window frame and masonry shall be carefully caulked. Contacts between windows or doors and adjacent steel including mullions shall be sealed with mastic furnished and applied by the Contractor. Windows shall be designed for glazing from the outside with spring wire glazing clips and glazing putty.
Mullions and anchors shall be manufacturer's standard, vertical mullions, anchors and bolts for attaching shall be furnished where required.
Adequate anchorage shall be provided to ensure firm installation.

SPL.3.3.4 Shop Painting
All windows shall be given a coating of gray metallic paint applied to all surfaces as paint base for prevention of corrosion. Prior to application of paint primer the steel sections shall be cleaned of rust, oil, grease and other foreign matter.

SPL.3.4 Method of Measurement
Steel windows shall be measured by actual in place installed with respective design/style and type of operation in square meters.
SPL.3.5 Basis of Payment
The actual area in square meters of steel windows satisfactorily installed and ready for service shall be the basis for payment based on the unit bid or contract unit price.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| SPL.3 | ALUMINUM FRAMED GLASS WINDOWS | LUMP SUM |

**ITEM SPL.2 – DOORS (INCLUDING JAMBS AND COMPLETE ACCESSORIES)**
SPL.2.1 Description
This Item shall consist of furnishing and installing all fabricated steel doors and frames equipped with fixing accessories and locking devices in accordance with the Plans and/or shop drawings and as herein specified.

SPL.2.2 Material Requirements
All door cladding plates or panels shall be formed from gauge 20 cold-rolled, prime quality steel. Frames shall be formed from gauge 16 cold-rolled steel. The materials used shall conform to the specification requirement of ASTM-A505.

SPL.2.2.1 Tubular Door (Casement/Sliding)

a) Hollow steel doors shall be custom built of size and details as indicated on the Plans and/or shop drawings. Cladding of doors shall be flush or louver type. Doors shall be 44 mm thick, side hinged or overhead· hung, as called for on the Plans.

b) Flush doors shall be constructed from two outer steel sheets not lighter than gauge 20, with edges welded and finished flush. The outer face sheets shall be reinforced with gauge 24 vertical channels or interlocking zee members. Sound insulation fillers of cork fiberboard, mineral wool board or asbestos shall be placed full height in spaces between reinforcing channels. Doors shall have smooth, flush surfaces without any visible joints or seams on exposed faces or stile edges except around glazed or louvered pane inserts. Top and bottom frame of doors shall have continuous reinforcing channels welded to face sheets.The channel for exterior doors shall be inverted type, not lighter than gauge 16, constructed to form a weather seal. Glazed opening shall be provided where indicated and molding around glazed openings shall not be lighter than gauge 20 metal.

SPL.2.2.2 Grille doors shall be of flat, square or round bars (wrought iron) as indicated on the Plans framed on galvanized black iron pipe or flat wrought iron bars, of the design shown on the Plans.

SPL.2.2.3 Tubular steel frames shall be machine pressed true to details, to size and shape as shown on the Plans and shall have full welded unit or knockdown field assembled type construction at corners and other joints.

SPL.2.2.4 Steel Louvers
Louvers shall be machine pressed conforming to the size and design indicated on the Plans with removable louver pane formed to fit the metal sub frame of openings. The steel sheets shall meet the requirement of ASTM 505, rivets of ASTM B 316, screws, bolts, nuts and washers of ASTM B 211.

SPL.2.2.5 Anchors and Fasteners

Anchors shall be steel, zinc coated or coated or painted with rust inhibitive paint, of sizes, shapes and design per manufacturer's standards.
Floor anchors shall not be lighter than gauge 18, with exception of jamb anchors for installing door frames in metal latch and plaster assemblies which shall be minimum of gauge 16 and shall not extend no more than 20 mm out of the back of the jamb.

SPL.2.3 Construction Requirements

SPL.2.3.1 Fabrication
Corner joints of frames shall be mitered and welded conforming to manufacturer's standard manual for metal doors. All contact edges be closed tight. Welds on exposed surface shall be ground smooth and shall be neat in appearance.
Joints for knock-down type frame corners shall be designed for simple field assembly of header to jamb members by concealed tenon, splice plates, or other type concealed in interlocking joint that will produce square and rigid corners. Joints shall be securely locked in place during erection and the alignment of adjoining members shall be maintained. All bolted connections shall be provided with lock units.

SPL.2.3.2 Shop Finish

a. Hot or Cold Phosphate Surface Treatment

All steel doors, frames and louvers shall be cleaned thoroughly, phosphate-treated to assure maximum paint adherence and prime finish, in accordance with the following operations:

1) After fabrication, grease and dirt shall be removed by a hot alkali solution and rinsed with hot water.

2) After cleaning, all parts shall be immersed in hot or cold phosphate solution and rinsed with a diluted solution or chronic acid.

3) After drying under controlled temperature, one coat of shop primer shall be applied by dipping type especially developed for materials treated with phosphates.

The cleaning, phosphate, dipping or spraying of shop primer and even drying shall be done on a continuous operation in the factory.

SPL.2.3.3 Installation
Steel doors, frames and louvers shall be set plumb and true in 'The joint between frame and masonry shall be carefully contacts between door/frame and adjacent steel shall be sealed with mastic.

SPL.2.3.4 Wall Anchors
A minimum of three anchors shall be provided for each jamb. Anchors shall be located opposite the top and bottom hinges and midway between top and bottom anchors.
Anchors for fastening frames to masonry shall be adjustable, and perforated and shall extend not less than 200 mm into masonry.
Anchors for fastening frames to metal or wood stud partitions shall be welded to metal or nailed to wood studs respectively.
Anchors for fastening frames to previously placed concrete or masonry shall be secured to existing construction with expansion bolts. Frames shall be fastened securely with anchors.
Anchors for fastening frames to partitions of plaster on metal lathe shall be secured firmly to back of frames that shall receive the latch. Adjustable strut anchors shall be provided on each side of frame for fastening to the structural members of the partition and of the ceiling framing above. The size and type of strut anchors shall be as recommended by the metal door manufacturer.

SPL.2.3.5 Floor Anchors
Floor anchors shall be provided at the bottom of each jamb member, anchorsshall be fixed/adjustable and drilled for 10mm diameter anchor bolts.
Where floor fill occurs, the bottom of frames shall terminate at the indicatedfinished floor levels and shall be supported by adjustable extensionclips resting on and anchored to the structural slab.

SPL.2.3.6 Hardware
Sidebronze butts for side hung doors, overhead pocket hardware for trackand roller types and locksets shall be suitable for the service required and subject to the approval of the Engineer and as provided in Item 1004, Hardware.

SPL.2.4 Method of Measurement
Steeldoors, frames, louvers, accessories and hardware shall be measured in square meters/per set as shown on the Plans. A set shall consist of metal door, jambs, anchors and hardware except locksets.

SPL.2.5 Basis of Payment
The area in m2 for every hollow steel door, flush door, grille door and steel louver installed ready for service shall be the basis of payment based on the unit bid or contract unit price

Payment will be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| SPL.2 | DOORS (INCLUDING JAMBS ANND COMPLETE ACCESSORIES | LUMP SUM |

**ITEM 1018 - CERAMIC TILES**

1018.1 Description
This Item shall consist of furnishing all ceramic tiles and cementitious materials, tools and equipment including labor required in undertaking the proper installation of walls and floor tiles as shown on the Plans and in accordance with this Specification.

1018.2 Material Requirements

1018.2.1 Ceramic tiles and trims shall be made of clay, or a mixture of clay and other materials which is called the body of the tile. Tile bodies are classified by ASTM C 242 as to their degree of water absorption. Ceramic tiles and trims are manufactured either by dust-pressed process in which the clays are ground to dust mixed with a minimum of water shaped in steel dies and then fired or by plastic process in which the clays are made plastic by mixing with water, shaped by extrusion or in molds and then fired.

1018.2.1.1 Glazed Tiles and Trims
Glazed tiles' and trims shall have an impervious face of ceramic materials fused onto the body of the tiles and trims. The glazed surface may be clear white or colored depending on the color scheme approved by the Engineer. Standard glazes may be bright (glossy) semimatte (Less glossy) matte (dull) or crystalline

(mottled and textured; good resistance to abrasion). Glazed tiles are used principally for walls; crystalline glazed tiles may be used for floors provided how8ver that these are used as light duty floors.

1018.2.1.2 Unglazed Tiles
Unglazed tiles shall be hard dense tile of homogeneous composition.
Its color and characteristics are determined by the materials used in the body, the method of manufacture and the thermal treatment. It is used primarily for floors and walks.

1018.2.1.3 Trims
Trims are manufactured to match wall tile color, texture and to coordinate with it in dimension. These are shaped in various ceramic trim units such as caps, bases, coves, bullnoses, corners, angles, etc.that are necessary for edging or making a transition between intersecting planes.

1018.2.1.4 Accessories
Accessories like some soap holders and shall be made wall mounted type with colors to reconcile with the color of the adjacent wall tiles.

1018.2.1.5 Cement
Cement shall be Portland conforming to the specification requirements defined in Item 700, Hydraulic Cement.

1018.2.1.6 Sand
Sand shall be well graded fine aggregate clean river sand, free from soluble salts and organic impurities.

1018.2.1.7 Lime
Lime shall be hydrated lime with free un hydrated oxide and magnesium oxide content not to exceed 8 percent by weight.

1018.3 Construction Requirements
Tile work shall not be started until roughing-ins for plumbing, electrical and other trades have been completed and tested. The work of all other trades shall be protected from damage.

1018.3.1 Surface Preparation

a) Mortar mix for scratch coat and setting bed shall consist of one part Portland cement 1/4 part lime and 3 parts sand by volume. Surface to receive tile must be level, true to elevation, dry, free from dirt, oil and other ointments. Allow at least seven days curing of scratch coat and setting bed. Installation work shall not be allowed to proceed until unsatisfactory conditions are corrected.

b) Bond coat shall be portland cement paste.

1018.3.1.1 Thoroughly dampen surfaces of masonry or concrete walls before scratch coat is applied.

1018.3.1.2 On masonry or concrete surface first apply a thin coat with pressure, then bring it out sufficiently to compensate for the major irregularities of the surface to a thickness not less than 10 mm. at any point.

1018.3.1.3 Evenly rate scratch coat to provide good mechanical key before the mortar mix has fully hardened.

1018.3.2Installation Procedure
Ceramic tiles shall be soaked in clean water prior to installation for a minimum of one hour

1018.3.2.1 Ceramic Glazed Wall Tiles

a) Determine and mark layout of ceramic tiles, joint location, position of trims and fixtures so as to minimize cut less than one-half tile in size.
b) Thoroughly dampen surface of wall but do not saturate surface.
c) Apply a bond coat mix with consistency of cream paste 1.5 mm thick to the wall surface or to the back of the tile to be laid.
d) Lay the tiles true to profile then exert pressure and tamp tile surface before the bond coat mix has initially set.
e) Continue with the next full tile to be laid and pressed firmly upon the setting bed tamped until flush and in place of the other tiles.
f) Intersections and returns shall be formed accurately using the appropriate trims.
g) All lines shall be kept straight and true to profiles, plumbed and internal corners rounded using the appropriate trims.

1018.3.2.2 Vitrified Unglazed Floor Tiles

a) Before tire is applied the floor surface shall be tested for levelness or uniformity of slope by' flooding it with water. Area where water ponds are filled or levelled, shall be retested before the setting bed is applied.
b) Establish ljnes of borders and center of the walls at the field work in both direction to perrhit the pattern to be laid with a minimum of cut tiles.
c) Clean concrete subfloor then moisten but do not soak. Then sprinkle dry cement over the surface and spread the mortar on the setting bed.
d) Apply and spread mortar mix for setting bed and tamp to assure good bond over the entire area to be laid with tile.
e) Pitch floor to drain as shown on Plans or as directed by the Engineer
f) Allow the setting bed to set sufficiently to be worked over then spread a bond coat over the surface and lay tile in accordance with Items 1019'.3.2.1 a, b, c,d, e, f, g.

1018.3.3 Grouting and Pointing

1018.3.3.1 Tiles shall have laid in place for at least 24 hours before grouting of the joints is started. Grouting mortar shall be white Portland cement or blended with pigments to acquire the color appropriate for the ceramic tile.

1018.3.3.2 Grouting mortar shall be applied over the tile by float or squeegee stroked diagonally across the joints. Remove excess mortar with a wet sponge stroked diagonally or in a circular motion after 12-15 minutes. Follow with a barely damp or dry sponge to remove remaining haze while smoothing all grouted joints.

1018.3.3 Cleaning

a) Clean ceramic tile surfaces thoroughly as possible upon completion of grouting.
b) Remove all grout haze, observing tile manufacturers recommendations as to use of acid or chemical cleaners.
c) Rinse tile thoroughly with clean water before and after using chemical cleaners.
d) Polish surface of tile with soft cloth.

1018.3.4 Protection from Construction Dirt

a) Apply a protective coat of neutral cleanser solution diluted with water in the proportion of 1:4 or 1 liter cleanser concentrate to 1 gallon water.
b) In addition, cover tile flooring with heavy-duty no staining construction paper, taped in place.
c) Just before final acceptance of the work remove paper and rinse protective coat of neutral cleaner from tile surface. Do not let protective paper get torn 'or removed.

1018.4 Method of Measurement

All works performed under this Item shall be measured in square meters for areas actually laid with ceramic tiles and accepted to the satisfaction of the Engineer.

1018.5 Basis of Payment

Ceramic tile work determined and provided in the Bill of Bill of Quantities shall be paid for based at the unit bid price which price and payment constitute full compensation for furnishing all materials, tools, equipment and other incidentals necessary to complete this Item.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1018 | CERAMIC TILES | SQ.M. |

**ITEM 1032 – PAINTING WORKS (MASONRY/CONCRETE, WOOD, STEEL)**

1032.1 Description

This Item shall consist of furnishing all paint materials, varnish and other related products, labor, tools, equipment and plant required in undertaking the proper application of painting, varnishing and related works indicated on the Plans and in accordance with this Specification.

1032.2 Material Requirements

1032.2.1 Paint Materials

All types of paint material, varnish and other related product shall be subject to random test as to material composition by the Bureau of Research and Standard, DPWH or the National Institute of Science and Technology. (Use the following approved and tested brand name: Boysen, Davies, Dutch Boy, Fuller 0 Brien, or any approved equal).

1032.2.2 Tinting Colors

Tinting colors shall be first grade quality, pigment ground in alkyd resin that disperses and mixes easily with paint to produced the color desired. Use the same brand of paint and tinting color to effect good paint body.

1032.2.3 Concrete Neutralizer

Concrete neutralizer shall be first grade quality concentrate diluted with clean water and applied as surface conditioner of new interior and exterior walls thus improving paint adhesion and durability.

1032.2.4 Silicon Water Repellant

Silicon water repellant shall be transparent water shield especially formulated to repel rain and moisture on exterior masonry surfaces.

1032.2.5 Patching Compound

Patching compound shall be fine powder type material like calciumine that can be mixed into putty consistency, with oil base primers and paints to fill minor surface dents and imperfections.

1032.2.6 Varnish

Varnish shall be a homogeneous solution of resin, drying oil, drier and solvent. It shall be extremely durable clear coating, highly resistant to wear and tear without cracking, peeling, whitening, spotting, etc. with minimum loss of gloss for a maximum period of time.

1032.2.7 Lacquer

Lacquer shall be any type of organic coating that dries rapidly and solely by evaporation of the solvent. Typical solvent are acetates, alcohols and ketones. Although lacquers were generally based on nitrocellulose, manufacturers currently use, vinyl resins, plasticizers and reacted drying oils to improve adhesion and elasticity.

1032.2.8 Shellac

Shellac shall be a solution of refined lac resin in denatured alcohol. It dries by evaporation of the alcohol. The resin is generally furnished in orange and bleached grades.

1032.2.9 Sanding Sealer

Sanding sealer shall be quick drying lacquer, formulated to provide quick dry, good holdout of succeeding coats, and containing sanding agents such as zinc stearate to allow dry sanding of sealer.

1032.2.10 Glazing Putty

Glazing putty shall be alkyd-type product for filling minor surface unevenness.

1032.2.11 Natural Wood Paste Filler

Wood paste filler shall be quality filler for filling and sealing open grain of interior wood. It shall produce a level finish for following coats of paint varnish/lacquer and other related products.

1032.2.12 Schedule

Exterior

| | | |
|---|---|---|
| a) | Plain cement plastered finish to be painted | -3 coats Acrylic base masonry paint |
| b) | Concrete exposed aggregate and/or tool finish | -1 coat water repellant |
| c) | Ferrous metal | -1 coat primer and 2 coats enamel pain |
| d) | Galvanized metal | -1 coat zinc chromate primer and 2 coats portland cement paint |
| e) | Wood painted finish | -3 coats oil based paint |
| f) | Wood varnished finish | -varnish water repellant |

Interior

a) Plain cement plastered finish to be painted - 2 coats acrylic base masonry paint

b) Concrete exposed aggregate and/or tool finish - clean surface

c) Ferrous metal -1 coat primer and 2 coats enamel paint

d) Woodwork sea-mist -3 coats of 3 parts thinner 1 part lacquer

e) Woodwork varnish - 1st coat, of one part sanding sealer to one part solvent 2nd coat of 2/3 sanding sealer to 1/3 solvent

f) Woodwork painted - 3 coats of oil base paint finish 109

g) Ceiling boards textured finish -1 coat oil based paint allow to dry then patch surfaces unevenness and apply textured paint coat

1032.3 Construction Requirements

The Contractor prior to commencement of the painting, varnishing and related work shall examine the surfaces to be applied in order not to jeopardize the quality and appearances of the painting varnishing and related works.

1032.3.1 Surface Preparation

All surfaces shall be in proper condition to receive the finish. Woodworks shall be hand-sanded smooth and dusted clean. All knotholes pitch pockets or sappy portions shall be sealed with natural wood filler. Nail holes, cracks or defects shall be carefully puttied after the first coat, matching the color of paint.
Interior woodworks shall be sandpapered between coats. Cracks, holes of imperfections in plaster shall be filled with patching compound and smoothed off to match adjoining surfaces.

Concrete and masonry surfaces shall be coated with concrete neutralizer and allowed to dry before any painting primer coat is applied. When surface is dried apply first coating. Hairline cracks and unevenness shall be patched and sealed with approved putty or patching compound.
After all defects are corrected apply the finish coats as specified on the Plans (color scheme approved).
Metal shall be clean, dry and free from mill scale and rust. Remove all grease and oil from surfaces. Wash unprimed galvanized metal with etching solution and allow it to dry. Where required to prime coat surface with Red Lead Primer same shall be approved by the Engineer.
In addition the Contractor shall undertake the following:

1. Voids, cracks, nick etc. will be repaired with proper patching material and finished flushed with surrounding surfaces.
2. Marred or damaged shop coats on metal shall be spot primed with appropriate metal primer.
3. Painting and varnishing works shall not be commenced when it is too hot or cold.
4. Allow appropriate ventilation during application and drying period.
5. All hardware will be fitted and removed or protected prior to painting and varnishing works.

1032.3.2 Application

Paints when applied by brush shall become non-fluid, thick enough to lay down as adequate film of wet paint. Brush marks shall flaw out after application of paint. Paints made for application by roller must be similar to brushing paint. It must be nonstick when thinned to spraying viscosity so that it will break up easily into droplets.
Paint is atomized by high pressure pumping rather than broken up by the large volume ·of air mixed with it. These procedures change the required properties of the paint.

1032.3.3 Mixing and Thinning

At the time of application paint shall show no sign of deterioration. Paint shall be thoroughly stirred, strained and kept at a uniform consistency during application. Paints of different manufacture shall not be mixed together. When thinning is necessary, this may be done immediately prior to application in accordance with the manufacturer's directions, but not in excess of 1 pint of suitable thinner per gallon of the paint.

1032.3.4 Storage

All material to be used under this Item shall be stored in a single place to be designated by the Engineer and such place shall be kept .
neat and clean at all time. Necessary precaution to avoid fire must be observed by removing oily rags, waste, etc. at the end of daily work.

1032.3.5 Cleaning

All cloths and cotton waste which constitute fire hazards shall be placed in metal containers or destroyed at the end of daily works. Upon completion of the work, all staging, scaffolding and paint containers shall be removed. Paint drips, oil, or stains on adjacent surfaces shall be removed and the entire job left clean and acceptable to the Engineer.

1032.3.6 Workmanship in General

a) All paints shall be evenly applied. Coats shall be of proper consistency and well brushed out so as to show a minimum of brush marks.

b) All coats shall be thoroughly dry before the succeeding coat is applied.

c) Where surfaces are not fully covered or cannot be satisfactorily finished in the number of coats specified such preparatory coats and subsequent coats as may be required shall be applied to attain the desired evenness of surface without extra cost to the owner.

d) Where surface is not in proper condition to receive the coat the Engineer shall be notified immediately. Work on the questioned portion(s) shall not start until clearance be proceed is ordered by , the Engineer.

e) Hardware, lighting fixture and other similar items shall be removed or 'protected during the painting varnishing and related work operations and re-installed after completion of the work.

1032.3.7 Procedure for Sea-Mist Finish

a) Depress wood grain by steel brush and sand surface lightly.

b) Apply sanding sealer.

c) Apply two coats of industrial lacquer paint.

d) Spray last coat of industrial lacquer paint mixed with sanding sealer.

e) Apply wood paste filler thinned with turpentine or paint thinner into the wood surface.

f) Wipe off wood paste filler immediately.

g) Spray flat or gloss lacquer whichever is specified.

1032.3.8 Procedure for Varnish Finish

a) Sand surface thoroughly.

b) Putty all cracks and other wood imperfections with wood paste filler.

c) Apply oil stain.

d) Apply lacquer sanding sealer.

e) Sand surface along the grain.

f) Spray three (3) coats of clear dead flat lacquer.

g) Polish surface coated using cloth pad.

h) Spray gloss lacquer or flat lacquer whichever is desired or specified.

1032.3.9 Procedure for Ducco Finish

a) Sand surface thoroughly.

b) Apply primer su[[rface white or gray by brush or spray.

c) Apply lacquer spot putty in thin coat. Allow each coat for become thoroughly dry before applying next coat.

d) Apply primer surfaces and then allow drying in two (2) hours before applying the next coat.

e) Apply a coat of flat tone semi-gloss enamel as per color scheme submitted and approved by the Engineer.

1032.4 Method of Measurement
The areas of concrete, wood and metal surfaces applied with varnish, paint and other related coating materials shall be measured in square meters as desired and accepted to the satisfaction of the Engineer.

1032.5 Basis of Payment
The accepted work shall be paid at the unit bid price, which price and payment constitute full compensation for furnishing all materials, labor, equipment, tools and other incidental necessary to complete this Item.
Payment will made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1032(a) | PAINTING WORKS | SQ.M. |

**ITEM 1047 – METAL STRUCTURES**
1047.1 Description
This work shall consist of steel structures and the steel structure portions of composite structures, constructed in reasonably close conformity with the lines, grades and dimensions shown on the Plans or established by the Engineer.
The work will include the furnishing, fabricating, hauling, erecting, welding and painting of structural metals called for in the Special Provision or shown on the Plans. Structural metals will include structural steel, rivet, welding, special and alloy steels, steel forgings and castings and iron castings. This work will also include any incidental metal construction not otherwise provided for, all in accordance with these Specifications, Plans and Special Provisions.

1047.2 Material and Construction Requirements
Materials shall meet the requirements of Item 712, Structural Metal; Item 409, Welded Structural Steel, and Item 409, Welded Structural Steel; and Item 709, Paints.

1047.3 Method of Measurement

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1047 | METAL STRUCTURES | Lump Sum |

**ITEM 1014(1)b2 - PREPAINTED METAL SHEETS**
1014(1)b2.1 Description
This Item shall consist of furnishing all pre-painted metal sheet materials, tools and equipment, plant including labor required in undertaking the proper installation complete as shown on the Plans and in accordance with this Specification.

1014(1)b2.2 Material Requirements
All pre-painted metal sheet and roofing accessories shall be oven baked painted true to profiles indicated on the ·Plans.

1014(1)b2.2.1 Pre-Painted Roofing Sheets
Pre-painted roofing sheets shall be fabricated from cold rolled galvanized iron sheets specially tempered steel for extra strength and durability. It shall conform to the material requirements defined in PNS 67: 1985. Profile section in identifying the architectural moulded rib to,be used are as follows: Regular corrugated, Quad-rib, Tri-wave, Rib-wide, twin-rib, etc. Desired color shall be subject to the approval of the Architect/Engineer.
1014.2.2 Gutters, Valleys, Flashings Hip and Ridge roll shall be fabricated from gauge 24 (.600 mm thick) cold-rolled plain galvanized iron sheets specially tempered steel. Profile section shall be as indicated on the Plans.
1014.2.3 Fastening hardware shall be of galvanized iron straps and rivets. G.I. straps are of .500 mm thick x 16 mm wide x 267 mm long (gauge 26 x 5/8" x 10-1/2") and standard rivets.

1014(1)b2.2.4 Base metal thickness shall correspond to the following gauge designation available locally as follows:

a) Base Metal Thickness — Designated Gauges
.400 mm thick — Gauge 28

| | |
|---|---|
| **.500 mm thick** | **Gauge 26** |
| .600 mm thick | Gauge 24 |
| .800 mm thick | Gauge 22 |

b) Protective Coatings

| | Thickness |
|---|---|
| 1. Zinc | 34.4 microns (244 gm/m2) |
| 2. Paint coatings | Top coat 15.20 microns<br>Bottom coat 6.8 microns |

a) Overall thickness with protective coats

| | |
|---|---|
| b) .400 mm | .428-451 mm |
| .500 mm | .532-551 mm |
| .600 mm | .638-651 mm |

c) Length of roofing sheets - available in cut to length long span length up to 18.29 meters

d) Special length and thickness are available by arrangements.

1014(1)b2.3 Construction Requirements
Before any installation work is commenced, the Contractor shall ascertain that the top faces of the purlins are in proper alignment. Correct the alignment as necessary in order to have the top faces of the purlins on an even plane.

1014(1)b2.3.1 Handling/Lifting/Positioning of Sheets
Sheets shall be handled carefully to prevent damage to the paint coating. Lift all sheets or sheet packs on to the roof frame with the overlapping down-turned edge facing towards the side of the roof where installation will commence, otherwise sheets will have to be turned end-to-end during installation.

1014(1)b2.3.2 Installation Procedure

1014(1)b2.3.2.1 Start roofing installation by placing the first sheet in position with the downturned edge in line with other building elements and fastened to supports as recommended.
1014(1)b2.3.2.2 Place the downturned edge of the next sheet over the edge of the first sheet, to provide side lap and hold the side lap firmly in place. Continue the same procedure for subsequent sheets until the whole roofing area is covered and/or (Adopt installation procedure provided in the instruction manual for each type of Architectural molded rib profile section).

1014(1)b2.3.2.3 For walling applications follow the procedure for roofing. Allow a minimum end lap of 100 mm (4") for vertical walling.

1014(1)b2.3.3 Gutters, Valleys, Flashing ridge and Hip rolls

Gutters, valleys, flashing ridge and hip rolls shall be fastened where indicated on the Plans by self-tapping screws or galvanized iron straps and rivets.

1014(1)b2.3.4 End Laps
In case handling or transport consideration requires to use two or more end lapped sheets to provide full length coverage for the roof run, install each line of sheets from bottom to top or from eave line to apex of roof framing. Provide 150 mm minimum end lap.

1014(1)b2.3.5 Anchorage/Fastening

1014(1)b2.3.5.1 Pre-painted steel roofing sheets shall be fastened to the wood purlins with standard length G.I. straps and rivets.
1014(1)b2.3.5.2 For steel frame up to 4.5 mm thick use self-drilling screw No. 12 by 35 mm long hexagonal head with neoprene washer.
1014(1)b2.3.5.3 For steel support up to 5 mm thick or more use thread cutting screw No. 12 by 40 mm long hexagonal head with neoprene washer.
1014(1)b2.3.5.4 Side lap fastener use self-drilling screw NO.1 0 by 16 mm long hexagonal head with neoprene washer.
1014(1)b2.3.5.5 Valley fastened to lumber and for walling use self-drilling wood screw No. 12 by 25 mm long hexagonal head with neoprene washer.
1014(1)b2.3.5.6 Valleys fastened to steel supports use self-drilling screws, hexagonal head with neoprene washer. Drill size is 5 mm diameter.

1014(1)b2.3.6 Cutting of Sheets

1014(1)b2.3.6.1 In cutting pre painted steel roofing sheets and accessories to place the exposed color side down. Cutting shall be carried out on the ground and not over the top of other painted roofing product.

1014(1)b2.3.6.2 Power cutting or drilling to be done or carried out on pre-painted products already installed or laid in position, the area around holes or cuts shall be masked to shield the paint from hot fillings.

1014(1)b2.3.7 Storage and Protection
Pre-painted steel roofing, walling products and accessories should be delivered to the jobsite in strapped bundles. Sheets and/or bundles shall be neatly stacked in the ground and if left in the open it shall be protected by covering the stack materials with loose tarpaulin.

1014(1)b2.4 Method of Measurement
The work done under this Item shall be measured by actual area covered or installed with pre-painted steel roofing and/or walling in square meters and accepted to the satisfaction of the Engineer/Architect.

1014(1)b2.5 Basis of Payment
The area of pre-painted steel roofing and/or walling in square meters as provided in Section 1014(1)b2 shall be paid for at the unit bid or contract unit price which payment shall constitute full compensation including labor, materials, tools and incidents necessary to complete this Item.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1014(1)b2 | PRE PAINTED METAL SHEETS | SQ.M. |

**ITEM 1100 - CONDUITS, BOXES & FITTINGS**
1100.1 Description

This Item shall consist of the furnishing and installation of the complete conduit work consisting of electrical conduits; conduit boxes such as junction boxes, pull boxes, utility boxes, octagonal and square boxes; conduit fittings such as couplings, locknuts and bushings and other electrical materials needed to complete the conduit roughing-in work of this project.

1100.2 Material Requirements
All materials shall be brand new and shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the Philippine Standard Agency (PSA) mark.

1100.2.1 Conduits
Conduits shall be standard rigid steel, zinc coated or galvanized. Intermediate metal conduit may be used if shown or specified on the approved Plans. PVC conduit if required shall be Schedule 40. Enamel coated steel conduits and conduits with rough inner surfaces are not acceptable.

1100.2.2 Conduit Boxes
All conduit boxes shall be Code gauge steel and galvanized. Outlet boxes shall be galvanized pressed steel of standard make. In general, outlet boxes shall be at least 100 mm square or octagonal, 53 mm deep and 16 mm minimum gauge.

1100.2.3 Conduit Fittings
All conduit fittings such as locknuts and bushings shall be galvanized of standard make.

1100.3 Construction Requirements
All works throughout shall be executed in the best practice in a workmanlike manner by qualified and experienced electricians under the immediate supervision of a duly licensed Electrical Engineer.

1100.3.1 Conduits
Conduits should be cut square with a hacksaw and reamed. Bends shall be made with the required radius. In making bends only conduit bending apparatus will be used. The use of a pipe tee or vise for bending conduits shall not be permitted. Conduits which have been crushed, deformed or flattened shall not be installed. No running thread shall be allowed. Conduit runs crossing construction joints of the building shall be provided with standard expansion fittings of the approved type. No conduits shall be used in any system smaller than 12 mm diameter electric trade size nor shall have more than four (4) 9O-degree bends in anyone run and where necessary, pull boxes shall be provided.

All ends of conduits which are left empty in cabinets and conduit boxes shall be plugged with lead or approved pipe caps so as to prevent the entrance of white ants and dirt within the conduit system. Pull wires shall be inserted in the empty ducts before they are closed with lead or pipe caps and shall be left therein for future use.

On exposed work, all pipes and outlet boxes shall be secured by means of galvanized metal clamps which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves for big pipes and rolled lead sheet for small pipes. All pipes shall be run at right angles to and parallel with the surrounding walls. No diagonal run shall be allowed and all bends and offsets shall be avoided as much as possible. Conduits shall be supported at 1,500 mm intervals maximum.

1100.3.2 Conduit Boxes & Fittings
Provide conduit boxes for pulling and splicing wires and outlet boxes for installation of wiring devices.
As a rule, provide junction boxes or pull boxes in all runs greater than 30 meters in length, for horizontal runs. For other lengths, provide boxes as required for splices or pulling. Pull boxes shall be installed in inconspicuous but accessible locations.
Support boxes independently of conduits entering by means of bolts, red hangers or other suitable means.
Conduit boxes shall be installed plumb and securely fastened. They shall be set flush with the surface of the structure in which they are installed where conduits are run concealed.

All convenience and wall switch outlet boxes for concealed conduit work shall be deep, rectangular flush type boxes. Four-inch octagonal flush type boxes shall be used for all ceiling light outlets and shall be of the deep type where three or more conduits connect to a single box.
Floor mounted outlet boxes required shall be waterproof type with flush brass floor plate and brass bell nozzle.
All boxes shall be painted with antirust red lead paint after installation.
All conduits shall be fitted with approved standard galvanized bushing and locknuts where they enter cabinets and conduit boxes.
Junction and pull boxes of code gauge steel shall be provided as indicated or as required to facilitate the pulling of wires and cables.

1100.4 Method of Measurement
The work under this Item shall be measured either by lengths, pieces, pairs, lot and set actually placed and installed as shown on the approved Plans.

1100.5 Basis of Payment
All works performed and measured and as provided for in the Bill of Quantities shall be paid for at the Unit Bid or Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidentals necessary to complete this Item.

1100.6 General Specifications
The work to be done under this division of specifications consists of the fabrication, furnishing, delivery and installation, complete in all details of the electrical work, at the subject premises and all work material's incidental to the proper completion of the installation, except those portions of the work which are expressly stated to be 90ne by other fields. All' works shall be done in accordance with the rules and regulations and with the specifications.

1100.7 Specifications on:

1. Lighting fixtures and lamp

All lighting fixtures and lamps are as specified and listed on lighting fixture schedule.
For fluorescent lamp, it shall be 40-watt rapid start cool-white.All fluorescent ballast shall be 230 volt, high power factor, of good quality materials and approved by the Bureau of Product Standards (BPS).

2. Material Requirements

All materials to be used shall conform to the BPS specification.

3. Construction Requirements

All grounding system installation shall be executed in accordance with the approved plans.
Grounding system shall include building perimeter ground wires, ground rods, clamps, connectors, ground wells and ground wire taps as shown in the approved design.

1100.8 Auxiliary Systems
All auxiliary systems such as telephone and intercom system, time clock system, fire alarm system and public address/nurse's call/paging system installations shall be done in accordance with the approved design.
All materials to be used shall conform to the Bureau of Product Standards (BPS) specifications.

1100.9 Important requirement regarding supervision of the work and submission of certificate of completion.
All wiring installation herein shall be done under the direct supervision of a licensed Electrical Engineer at the expense of the Contractor. The contractor shall submit the certificate of completion duly approved by the owner's representative.

1100.10 Test and guarantee
Upon completion of the electrical construction work, the contractor shall provide all test equipment and personnel and to submit written copies of all test results. The contractor shall guarantee the electrical installation are done and in accordance with the approved plans and specifications. The contractor shall guarantee that the electrical systems are free from' all grounds and from all defective workmanship and materials and will remain so for a period of one year from date and acceptance of works. Any defect shall be remedied by the Contractor at his own expense.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| (1) | RSC CONDUITS PIPE WITH COUPLINGS | LENGTH |
| (2) | LOCKNUT AND BUSHINGS | PAIRS |
| (3) | CONDUITS PIPE ADOPTOR | PIECES |
| (4) | UTILITY BOXES | PIECES |
| (5) | RUBBER TAPE | ROLLS |

**ITEM 1101 - WIRES AND WIRING DEVICES**
1101.1 Description
This Item shall consist of the furnishing and installation of all wires and wiring devices consisting of electric wires and cables, wall switches, convenience receptacles, heavy duty receptables and other devices shown on the approved Plans but not mentioned in these specifications.

1101.2 Material Requirements
Wires and cables shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the PSA mark. Unless specified or indicated otherwise, all power and lighting conductors shall be insulated for 600 volts.

All wires shall be copper, soft drawn and annealed, smooth and of cylindrical form and shall be centrally located inside the insulation.
All wiring devices shall be standard products of reputable electrical manufacturers. Wall switches shall be rated at least 1 OA, 250 volts and shall be spring operated, flush, tumbler type. Duplex convenience receptacles shall be rated at least 15A, 250 volts, flush, parallel slots.
Single heavy duty receptacles shall be rated at least 20A, 250 volts. 3wire, flush, polarized type.

1101.3 Construction Requirements
Conductors or wires shall not be drawn in conduits until after the cement piaster is dry and the conduits are thoroughly cleaned and free from dirt and moisture. In drawing wires into conduits, sufficient slack shall be allowed to permit easy connections for fixtures, switches, receptacles and other wiring devices without the use of additional splices.
All conductors of convenience outlets and lighting branch circuit home runs shall be wired with a minimum of 3.5 mm in size. Circuit home runs to panel boards shall not be smaller than 3.5 mm but all home runs to panel board more than 30 meters shall not be smaller than 5.5 mm. No conductor shall be less than 2 mm in size.
All wires of 14mm and larger in size shall be connected to panels and apparatus by means of approved type lugs or connectors of the solder less type, sufficiently large enough to enclose all strands of the conductors and securely fastened. They shall not loosen under vibration or normal strain.
All joints, taps and splices on wires larger than 14 mm shall be made of suitable solder less connectors of the approved type and size. They shall be taped with rubber and PVC tapes providing insulation not less than that of the conductors.
No splices or joints shall be permitted in either feeder or branch conductors except within outlet boxes or accessible junction boxes or pull boxes. All joints in branch circuit wiring shall be made mechanically and electrically secured by approved splicing devices and taped with rubber and PVC tapes in a manner which will make their insulation as that of the conductor.

All wall switches and receptacles shall be fitted with standard Bakelite face plate covers. Device plates for flush mounting shall be installed with all four edges in continuous contact with finished wall surfaces without the use of coiled wire or similar devices. Plaster fillings will not be permitted. Plates installed in wet locations shall be gasketed.
When more than one switch or device is indicated in a single location, gang plate shall be used.

1101.4 Method of Measurement
The work under this Item shall be measured either by meters, rolls, pieces, and set, actually placed and installed as shown on the Plans.

1101.5 Basis of Payment
All work performed and measured and as provided for in this Bid of Quantities shall be paid for at the Unit Bid or Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidentals necessary to complete this Item.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| (1) | ELECTRIC WIRE | METER OF ROLLS |
| (2) | SINGLE SWITCH | PIECES |
| (3) | TWO WAY SWITCH | PIECES |
| (4) | THREE WAY SWITCH | PIECES |
| (5) | DUPLEX CONVENIENCE RECEPTACLES | SETS |

**ITEM 1102 - POWER LOAD CENTER, SWITCHGEAR AND PANELBOARDS**
1102.1 Description
This Item shall consist of the furnishing and installation of the power load center unit substation or low voltage switchgear and distribution panel boards at the location shown or the approved Plans complete with transformer, circuit breakers, cabinets and all accessories, completely wired and ready for service.

1102.2 Material Requirements

All materials shall be brand new and shall be of the approved type. It shall conform to the requirements of the Philippine Electrical Code and shall bear the Philippine Standard Agency (PSA) mark.

1102.2.1 Power Load Center Unit Substation
The Contractor shall furnish and install an indoor-type Power Load Center Unit Substation at the location shown on the approved Plans if required. It shall be totally metal-enclosed, dead front and shall consist of the following coordinated component parts:

1102.2.2 High Voltage Primary Section:
High voltage primary incoming line section consisting of the following parts and related accessories:

a) One (1) Air-filled Interrupter Switch, 2-position (open-close) installed in a suitable air filled metal enclosure and shall have sufficient interrupting capacity to carry the electrical load. It shall be provided with key interlock with the cubicle for the power fuses to prevent access to the fuses unless the switch is open.
b) Three (3)-power fuses mounted in separate compartments within the switch housing and accessible by a hinged door.
c) One 1) set of high voltage potheads or 3-conductor cables or three single conductor cables
d) Lightning arresters shall be installed at the high voltage cubicle if required.

Items (a) and (b) above could be substituted with a power circuit breaker with the correct rating and capacity.
1102.2.3 Transformer Section
The transformer section shall consist of a power transformer with ratings and capacities as shown on the plans. It shall be oil liquid-filled non-flammable type and designed in accordance with the latest applicable standards.
The transformer shall be provided with four (4 approximately 2 1/2 % rated KVA taps on the primary winding in most cases one (1) above and three (3) below rated primary voltage and shall be changed by means of externally gang-operated manual tap changer only when the transformer is de-energized. Tap changing under load is acceptable if transformer has been so designed.

The following accessories shall be provided with the transformer, namely: drain valve, sampling device, filling connection, oil liquid level gauge, ground pad, top filter press connection, lifting lugs, diagrammatic nameplate, relief valve, thermometer and other necessary related accessories.
The high-voltage and low-voltage bushings and transition flange shall be properly coordinated for field connection to the incoming line section and low voltage switchboard section, respectively.

1102.2.4 Low-Voltage Switchboard Section
The low-voltage switchboard shall be standard modular-unitized units, metal-built, dead front, and safetytype construction and shall consist of the following:

(a) Switchboard Housing
The housing shall be heavy gauge steel sheet, dead front type, gray enamel finish complete with frame supports, steel bracings, steel sheet panel boards, removable rear plates, copper bus bars, and all other necessary accessories to insure sufficient mechanical strength and safety. It shall be provided with grounding bolts and clamps.

(b) Secondary Metering Section
The secondary metering section shall consist of one (1) ammeter, AC, indicating type; one (1) voltmeter, AC, indicating type, one (1) ammeter transfer switch for 3-phase; one (1) voltmeter transfer switch for 3phase; and current transformers of suitable rating and capacity.

The above-mentioned instruments shall be installed in one compartment above the main breaker and shall be complete with all necessary accessories completely wired, ready for use.

(c) Main Circuit Breaker
The main circuit breaker shall be draw-out type, manually or electrically operated as required with ratings and capacity as shown on the approved Plans.
The main breaker shall include insulated control switch if electrically operated, manual trip button, magnetic tripping devices, adjustable time over current protection and instantaneous short circuit trip and all necessary accessories to insure safe and efficient operation.

(d) Feeder Circuit Breakers
There shall be as many feeder breakers as are shown on the single line diagram or schematic riser diagram and schedule of loads and computations on the plans. The circuit breakers shall be draw out or molded case as required. The circuit breakers shall each have sufficient interrupting capacity and shall be manually operated complete with trip devices and all necessary accessories to insure safe and efficient operation. The number, ratings, capacities of the feeder branch circuit breakers shall be as shown on the approved Plans.

Circuit breakers shall each be of the indicating type, providing "ON" - "OFF" and "TRIP" positions of the operating handles and shall each be provided with nameplate for branch circuit designation. The circuit breaker shall be so designed that an overload or short on one pole automatically causes all poles to open.

1102.2.5 Low-Voltage' Switchgear
(For projects requiring 'low-voltage switchgear only).
The Contractor shall furnish and install low-voltage switchgear at the location shown on the plans. It shall be metal-clad, dead front, free standing, safety type construction and shall have copper bus bars of sufficient size, braced to resist allowable root mean square (RMS) symmetrical short circuit stresses, and all necessary accessories.
The low-voltage switchgear shall consist of the switchgear housing, secondary metering, main breaker and feeder branch circuitbreakers and all necessary accessories, completely wired, ready for service.

1102.2.6 Grounding System:
All non-current carrying metallic parts like conduits, cabinets and equipment frames shall be properly grounded in accordance with the Philippine Electrical Code, latest edition.
The size of the ground rods and ground wires shall be as shown on the approved Plans. The ground resistance shall not be more than 5 ohms.

Panel boards and Cabinets
Panel boards shall conform to the schedule of panel boards as shown on the approved Plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capacities of branch circuit breakers.
Panel boards shall consist of a factory completed dead front assembly mounted in an enclosing flush type cabinet consisting of code gauge galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two(2) keys. Panel boards shall be provided with - directories and shall be printed to indicate load served by each circuit.

Panel board cabinets and trims shall be suitable for the type of mounting shown on the approved Plans. The inside and outside of panel board cabinets and trims shall be factory painted with one rust proofing primer coat and two finish shop coats of pearl gray enamel paint.

Main and branch circuit breakers for panel boards shall have the rating, capacity and number of poles as shown on the approved Plans.Breakers shall be thermal magnetic type. Multiple breaker shall be of the common trip type having a single operating handle. For 50-ampere breaker or less, it may consist of single-pole breaker permanently assembled at the factory into a multi-pole unit.

1102.3 Construction Requirements
The Contractor shall install the Power Load Center Unit Substation or Low-Voltage Switchgear and Panel boards at the locations shown on the approved Plans. Standard panels and cabinets shall be used and assembled on the job. All panels shall be of dead front construction furnished with trims for flush or surface mounting as required.

1102.4 Method of Measurement
The work under this Item shall be measured either by set and pieces actually placed and installed as shown on the approved Plans.
1102.5 Basis of Payment
All works performed and measured and as provided for in the Bill of Quantities shall be paid for at the Unit Bid or Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidentals necessary to complete this Item.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1102.(a) | POWER LOAD CENTER, SWITCHGEAR AND PANELBOARDS | LUMP SUM |

**ITEM 1001 - STORM DRAINAGE AND SEWERAGE SYSTEM**
1001.1 Description
This Item shall consist of furnishing all materials, equipment and labor for the complete installation of the storm drainage system to include all piping's, gutters, canals, catch basins, junction boxes, hand holes, manholes and other appurtenant structures, and sewerage system to include all sanitary sewer piping and septic vault where no public sewer exist, from the building to the point of discharge.

1001.2 Material Requirements
1001.2.1 Materials for storm drainage system shall meet the requirements specified in the following standard specifications:

| | |
|---|---|
| Portland Cement | ASTM C-150 |
| Fine and Coarse Aggregate | ASTM C-33 |
| Reinforcing Steel | ASTM A-615 |
| Non-reinforced Concrete Pipes | ASTM C-14 |
| Reinforced Concrete Pipes | ASTM C-76 (AASHTO M-86) |
| Cast Iron Pipes (for conductors and downspout) | ASTM A-74 |
| Galvanized Iron Pipes Scheduled 40 (for conductors and downspouts) | ASTM A-120 |
| Polyvinyl Chloride (PVC) (for conductors and downspouts) | ASTM 2729 |

Where the covers for catch basins, junction boxes, manholes and canals for gratings are required same shall be made of wrought iron and of the dimensions as shown on the Plans.

1001.2.2 Materials for sewerage system shall meet the requirements specified in the following standard specifications:

| | |
|---|---|
| Cast Iron Pipes and Fittings | ASTM A-74 |
| Pig Lead (for securing and sealing joint) | ASTM B 29-77 |
| PVC Pipes and Fittings (where called in Plans) | ASTM 01784 |
| Solvent Cement (for securing PVC joints) | ASTM 02564 |

Where PVC pipes and fittings are used, joints shall be secured with rubber "0" ring or solvent cement, as the case maybe.
Oakum for joints in bell and spigot pipes shall be made from hemp fiber, braided or twisted and oil impregnated free from lumps, dirt and extraneous matter.

1001.3 Construction Requirements
1001.3.1 Installation of Pipes

Under no circumstances shall pipes shall be laid under water and when the trench condition or the weather is unsuitable for such work.

a. Bedding. Materials such as sand, sandy soil or any approved material shall be used to provide a firm foundation of uniform density. The bedding shall have a minimum thickness equivalent to one-fourth (1/ 4) of the pipe's diameter.
b. Laying of Pipes. Proper facilities shall be provided for lowering and' placing pipes into trenches in order to preclude damage. Laying of pipes shall start upgrade with the spigot end of bell-and-spigot pipe, or the tongue end of tongue-and-groove pipe, positioned towards the direction of the flow. The pipes shall be laid in accordance with the grades and alignments shown in the Plans.

The spigots or tongues shall be adjusted in bells or grooves to provide uniform space around joints to receive mortar. Blocking or wedging between spigot and bell or between tongue and groove to attain proper spacing shall be allowed provided such blocking/wedging shall not interfere and shall not affect the water tightness of the joint.

c. Bell and Spigot Joint for Drain Pipe. The first pipe shall be properly bedded at the required grade. Just below the spigot of the first unit, a sufficient space shall be provided for engaging the bell end of the second pipe.

The spigot shall be carefully cleaned with a wet brush and the upper exterior portion applied with mortar to such a thickness as to bring the inner surfaces of the abutting pipes flush and even. The bell end of the second pipe shall be cleaned with a wet brush and uniformly matched with the spigot of the first pipe so that the sections are closely fitted. After the second pipe is laid, the remainder of the joint shall be fitted with mortar, and a bead shall be formed around the outside of the joints with sufficient amount of additional mortar. The inside of the joints shall be wiped and finished smooth. The mortar bead on the outside shore immediately be protected with a cover of wet burlap or wet earth for at least three (3) days for curing.

d. Tongue and Groove Joint for Concrete Pipe. The first pipe shall be properly bedded. A shallow excavation shall be made underneath the joint and filled with mortar to provide a bed second pipe. The tongue end of the first pipe shall be carefully cleaned with wet brush and soft mortar applied around the upper half of the tongue. After cleaning and positioning the second pipe close to the first, mortar shall be applied around the lower half of the groove. With just sufficient thrust, the second pipe shall be brought in close contact with the first until mortar is squeezed out of the joint. Sufficient mortar shall be used to fill the joint and to form a bead on the outside.
e. Mortar for Joint. Mortar shall be a mixture of Portland Cement, sand and water mixed in the proportion by volume of one part cement to two parts of clean sand with just sufficient amount of water for plasticity.
f. Leaded Joints of Cast Iron Pipes. Joints of cast iron pipes shall be packed with braided or twisted oil-impregnated hemp or oakum, properly caulked around the joint. The packing shall be at least 20mm below the rim of the hub or bell and this space shall be filled with molten pig lead in one continuous pouring. The "ring" of pig lead formed around the joint shall be properly caulked by appropriate caulking tools to render the joints watertight.

1001.3.2 Concrete structures.

Concrete structures such as catch basins, canal gutters, junction boxes and manholes for the drainage system, and septic vault for sewerage system, shall be constructed in accordance with the Plans and Specifications on Concrete Work.

1001. 3.2 Sewer Connections and Clean-Outs

a) The outlet of the septic vault shall be connected to the street drain or to other discharge point where no sanitary sewer exists. Connection with the sanitary sewer shall not be made without the permission of the proper authorities, but shall be made in such a manner that any and all the service water, as well as house and other liquid wastes, will flow to the sanitary sewer. Provided, that isolated faucets used exclusively for garden purposes may, in the discretion of the proper authorities, be allowed not to flow into the sanitary sewer.

b) Clean-outs or rodding holes consisting of cast iron extensions with long sweep elbow fittings shall be provided at the ends of runs and at every change of directions. Clean-outs shall be capped with cast brass ferrules with threads and screwed-on removable brass plugs. Clean-outs extended outside the building and raised to the level of finished grade shall be terminated with the same cast brass ferrule with brass plug set into a concrete slab shall be 150mm thick and 300mm square, finish flush with grade.

1001.3.2 Incidental Earthwork

Incidental earthwork for the storm drainage and sewerage systems, such as excavation and backfilling shall be undertaken in accordance with applicable part of Excavation Filling and Grading.

1001.3.3 Inspection and Quality Control

Materials shall be inspected and accepted as to quality before same are installed. Piping's installed in trenches shall first be inspected, tested and approved by the Engineer before these are covered or backfilled. All defects/ lakes disclosed by the water test shall be remedied to the satisfaction of the Engineer and any extra cost shall be at the expense of the Contractor.

1001.4 Method of Measurement

Pipes, culverts, gutters, canals and gratings installed in place and accepted by the Engineer, shall be measured by the meter along their axes. Catch basins, junction boxes, manholes and septic vault shall be measured by the number of units constructed and accepted.

1001.5 Basis of Payment

The quantities as determined in sub-section 1001.4 shall be paid at the contract unit price for each of the Items which shall constitute full compensation for all materials, labor, tools and equipment and all other incidentals necessary to complete the Item.

Payment shall be made under:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1001.2 | STORM DRAINAGE AND SEWER SYSTEM | LUMP SUM |

**ITEM 1002 – PLUMBING AND PLUMBING FIXTURES**

1002.1 Description

This item shall consist of furnishing all materials, tools, equipment and fixtures required as shown on the Plans for the satisfactory performance of the entire plumbing system including installation in accordance with the edition of the National Plumbing Code, and this Specification.

1002.2 Material Requirements

All piping materials, fixtures and appliances fitting accessories whether specifically mentioned or not but necessary to complete this item shall be furnished and installed.

1002.2.1 Cast Iron Soil Pipes and Fittings

Pipes and fitting materials shall comply with the specification requirements defined in PNS/SAO 4-: 1974. The material and standards of manufacture are herein described:

Cast Iron - the casting shall be made of gray iron which shall be sound, free from cracks, sand and blow holes. They shall be uniformly low hardness that permits drilling and cutting by ordinary methods. Pipes and fittings shall be true to pattern and of compact closed grained structure.
Quality of Iron – the iron shall be made by the cupola, air furnace, electric furnace or other processes which shall be checked by regular chemical and physical control test. The result shall be gray iron of good quality.

Manufacture – the pipes shall be made with hub and spigot ends or hub ends only. All hubs for pipes and fitting shall be provided with held lead grooves and all spigot ends shall be made with beads or plain if machine cast centrifugally. Pugs shall be wrought or cast, machined to the dimension required and shall be free from defects.

Freedom from defects – pipes and fittings shall be true, smooth and cylindrical, their inner and outer surfaces being as nearly concentric as practicable. They shall be in all aspects, sound and good casting free from laps, pin holes or other imperfections and shall be neatly dressed and carefully fettled. The ends shall be finished reasonably square to their axes.

Clean-outs shall be made of heavy cast brass ferrule with counter sunk screw cover same diameter as the pipe except that they shall not be larger than 100mm diameter.
Caulking lead shall be of molten type peg lead conforming to specification requirements defined in ASTM B-29.
Oakum shall be twisted or braided hemp or abaca fibers slightly impregnated with oil.

1002.2.2 Water Supply Pipes and Fittings

Pipes shall be galvanized iron pipe schedule 40 conforming to specification requirements defined in ASTM A-120 with threaded connection. Under roads where necessary shall be suitably protected as shown on the Plans.
Fittings shall be malleable iron Type II, galvanized iron conforming to specification requirements defined in ASTM A338.

Valves

Valves for water supply shall be bronze body with threaded ends rated 21.0 kg/cm. square. All valves shall be gate valves unless otherwise specified. Gate valves shall have solid wedge body and disc conforming to specification requirements defined in ASTM B-62. Globe valves shall have plug type discs with ferrule threaded ends and bronze body.

Unions

Unions on ferrous pipe 50mm in diameter and smaller shall be malleable iron.

Water Meter

Water meter where required to be furnished by the Contract shall be of the type tested and approved by MWSS.

1002.2.3 Approved Alternate Pipes and Fittings

Pipes and fittings for sanitary and potable water lines as approved alternate shall be Unplasticized Polyvinyl Chloride Pipes and Fittings (UPVC).
Pipes and fittings shall be made of virgin materials conforming to specification requirements define in ASTM D-2241 and PNS 65: 1986. Fitting shall be molded type and designed for solvent cement joint connection for water lines and rubber O-ring seal joint for sanitary lines.

1002.2.5 Plumbing Fixtures and Fittings

All fittings and trimmings for fixtures shall be chromium-plated and polished brass unless otherwise approved. Exposed traps and supply pipes for fixtures shall be connected to the roughing in, piping system at the wall unless otherwise indicated on the Plans. Built-in fixtures shall be watertight with provision of water supply and drainage outlet, fitting and trap seal. Unless otherwise specified, all plumbing fixtures shall be made of vitreous china complete with fittings.

a) Water closet shall be vitreous china, free standing toilet combination, round front bottom outlet siphonic washdown bowl with extended rear self and closed coupled tank with cover complete with fittings and mounting accessories. Model make and color shall be submitted for approval prior to delivery at jobsite by the Engineer.
b) Lavatory shall be vitreous china, wall-hung with rear overflow and cast-in soap dishes, pocket hanger with integral china brackets, complete with twin faucets, supply pipes, P-trap and mounting accessories. Where indicated on the Plans to be counter top model make and color shall be approved by the Engineer.
c) Urinal shall be china vitreous, wall-hung wash-out urinal with extended shields and integral flush spreader, concealed wall-hanger pockets, 19mm top spud complete with fitting and mounting accessories. Model make and color shall be approved by the Engineer.

1002.2.6 Bathroom and Toilet Accessories

a) Shower head and fitting shall be movable, cone type with escutcheon arm complete with stainless steel shower valve and control lever, all exposed surface to be chromium finish.
b) Grab bars shall be made of tubular stainless steel pipe provided with safety grip and mounting flange.
c) Floor drains shall be made of stainless steel beehive type, measuring 100mm x 100mm, and provided with detachable stainless strainer, expanded metal lath type.
d) Toilet paper holder shall be vitreous china wall mounted. Color shall reconcile with the adjacent fixture and facing tiles.
e) Soap holder shall be vitreous china wall mounted. Color shall reconcile with the adjacent tile works.
f) Faucet(s) shall be made of stainless steel for interior use.
g) Hose-bib(s) shall be made of bronze cast finish.

1002.2.7 Special Plumbing Fixtures

a) Kitchen sink shall be made of stainless steel self-rimming, single compartment complete with supply fittings, strainer traps, dual control lever and other accessories.
b) Laboratory sink shall be made of cast iron metal with white porcelain finish with single compartment, flat rim ledge, 762mm x 533mm complete with supply fittings, strainer, trap and other accessories.
c) Scrub-up sink shall be made of cast iron metal with white porcelain finish measuring 610mm x 610mm complete with supply fittings, strainer, trap and wall mounting accessories.
d) X-ray developing tank shall be made of cast iron white porcelain finish with three (3) compartment x-ray processing tank, drain plug, open standing drain, 19mm IPS inlet spud complete with stand and mounting accessories
e) Squat bowl(s) shall be vitreous china, wash down squat bowl with integral foot treads, pail flush type. Color, make and type to be approved by the Engineer.
f) Grease traps shall be made of cast bronze with detachable cover and mounting accessories.

1002.2.8 Roof Drains, Downspout, Overflow Pipes and Steel Grating

The Contractor shall provide, fit and/or install necessary drains with strainers, where shown on the Plans. Each drain with strainer shall fit the size of the corresponding downspout (or roof leader) over which it is to be installed and in conformity with the following schedule:

a) Scupper drains (for balconies, parapet) shall be made of bronze base with flashing. Flange threaded outlet and convex with integral flashing clamp bolted to flange.
b) "Josam" type drains shall be made of bronze base semi-dome with large free area, flashing clamp and integral gravel stopper. To be used at roof decks, canopies, gutters, and elsewhere indicated on the Plans.
c) Downspouts when encased in concrete, unless otherwise shown on the Plans shall be polyvinyl chloride (PVC). Whether indicated or specified to be cast iron or galvanized iron the same shall meet the specification requirement as herein described.
d) Overflow pipes shall be made of galvanized iron pipe measuring at least 13mm diameter and spaced 200mm on center.
e) Steel grating shall be made of wrought iron metals of design on shop drawings approved and surfaces to be coated with shop finish.

1002.2.9 Fire Protection System

a. Fire hose cabinets shall be locally available consisting of 38mm diameter valve hose rack with nipple 30mm rubber lined hose cable with standing 4268 kg/cm square, nozzle 38mm diameter brass, chromium plated.
b. Fire standpipe system shall consist of risers and hose valves. Pipe shall be extra strong black iron. Valves to be high grade cast bronze mounted withstanding 79.40 kg. working pressure as indicated on the Plans.
c. Fire extinguisher shall be portable, suitable for Class A, B, C fires, mounted inside cabinet. Cabinet shall be full flush mounting door with aluminum trim for glass plate, frame and box shall be made of gauge 14 galvanized iron sheet with white interior and red exterior baked enamel finish over primer. Cabinet to be wall mounted and size to be able to accommodate the defined components.
d. Yard hydrant where shown on the Plans shall match the Integrated Fire Department requirements. Outlet shall be single 63mm diameter gate valves with chain connected caps.

1002.2.10 Built-in appliances such as urinal trough, lavatory and slope sink shall be made as indicated on the Plans, exposed surfaces to be tile wainscoating Complete with fitting accessories required as practiced in this specialty trade.

1002.3 Construction Requirements

The Contractor before any installation work is started shall carefully examine the Plans and shall investigate actual structural and finishing work condition affecting all his work. Where actual condition necessitates a rearrangement of the approved pipe layout, the Contractor shall prepare Plan(s) of the proposed pipe layout for approval by the Engineer.

1002.3.1 Installation of Soil, Waste, Drain and Vent Pipe

a) All cast iron soil and drainage pipes shall be pitch 6 mm per 300 mm but in no case flatter than 3mm per 300mm.
b) Horizontal lines shall be supported by well secured length heavy strap hangers. Vertical lines shall be secured strongly by hooks to the building frame and a suitable brackets or chairs shall be provided at the floor from which they start.

c) All main vertical soil and waste stacks shall be extended full size to and above the roof line to act as vents, except otherwise indicated on the Plans.
d) Vent pipes on roof spaces shall be run as close as possible to underside of roof with horizontal piping pitched down to stacks without forming traps. Vertical vent pipes may be connected into one main vent riser above the highest vented fixtures.
e) Where an end or circuit vent pipe from any fixtures is connected to a vent line serving other fixtures, the connections shall be at least 1.20 m above the floor on which the fixtures are located.
f) Horizontal waist line receiving the discharge from two or more fixtures shall be provided with end vents unless separate venting of fixtures is noted on the Plans.
g) All changes on pipe sizes on soil and waste lines shall be made with reducing fittings or recessed reducers. All changes in directions shall be made by appropriate use of 45 degrees wyes, half wyes, long sweep quarter bends or elbows may be used in soil and waste lines where the change in the direction of flow is from the horizontal to the vertical and on the discharge from waste closets. Where it becomes necessary to use short radius fittings in other locations the approval of the Engineer shall be obtained prior to installation of the same.
h) All joints of cast iron pipes in bell and spigot shall be firmly packed with oakum or hemp or caulked with pig at least 25 mm deep.
i) Cleanouts at the bottom of each soil stack, waste stack, interior down spout and where else indicated shall be the same size as the pipe up to and including 102 mm, 152 mm, for larger pipes.

   Cleanouts on floors shall be cast iron ferulle caulked into cast hub and fitted with cast brass screw plug flush with floor. Cleanouts for threaded pipes shall be installed at the foot of soil, waste and drain stacks and on each building drain outside the building.

j) Vent pipe shall be flashed and made water tight at the roof with ferrule lead sheet. Flushing shall be turned down into pipes.
k) Each fixtures and place of equipment requiring connection to the drainage system except fixtures with continuous waste shall be equipped with a trap. Each trap shall be placed as near to the fixture as possible. Traps installed on threaded pipe shall be recessed drainage pattern.
l) Overhead horizontal runs of pipes shall be hung with adjustable wrought iron pipe hanger spaced not over 3.04 m apart except hub and spigot soil pipe which shall have hanger spaced not over 1.50 m apart and located near a hub.

1002.3.7 Inspection, Warranty Test and Disinfection
All pipes, fittings, traps, fixtures, appurtenances and equipment of the plumbing and drainage system shall be inspected and approved by the Engineer to insure compliance with all requirements of all Codes and Regulations referred to in this Specification.

1002.3.7.1 Drainage System Test

1002.3.7.2
a) The entire drainage and venting system shall have all necessary openings which can be plugged to permit the entire system to be filled with water to the level of the highest stack vent above the roof.
b) The system shall hold this water for a full 30 minutes during which time there shall be no drop greater than 102 mm.
c) Where only a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system except that a vertical stack 3.00 m highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure or water pump may be used to supply the required pressure.
d) If and when the Engineer decides that an additional test is needed, such as an air to smoke test on the drainage system, the Contractor shall perform such test without any additional cost.

1002.3.7.3 Water Test on System
a) Upon completion of roughing-in and before connecting fixtures the entire cold-water piping system shall be tested at a hydrostatic pressure 1 ½ times the expected working pressure in the system during the operation and remained tight and leak-proofed.
b) Where piping system is to be concealed the piping system shall be separately in manner similar to that described for the entire system and in the presence of the Engineer or his duly designated representative.

1002.3.7.4 Defective Work
a) All defected materials replaced and tested will be repeated until satisfactory performance is attained.
b) Any material replaced for the satisfactory performance of the system made shall be at the expense of the Contractor.
c) Caulking of screwed joints or holes will not be permitted.

1002.3.7.5 Disinfection
a) The entire water distribution system shall be thoroughly flushed and treated with chlorine before it is operated for public use.
b) Disinfection materials shall be liquid chlorine or hypochlorite and shall be introduced in a manner approved as practiced or approved by the Engineer into the water distribution system.
c) After a contact period of not less than sixteen hours, the heavenly chlorinated water shall be flushed from the system with potable water.
d) Valves for the water distribution system shall be opened and closed several times during the 16 hours chlorination treatment is done.

1002.3.8 As-Built Drawings
Upon completion of the work, the Contractor shall submit two sets of prints with all as-built changes shown on the drawings in a neat workmanship manner. Such prints shall show changes or actual installation and conditions of the plumbing system in comparison with the original drawings.

1002.4 Method of Measurement
The work done under this item shall be quantified per length and/or number of units as provided in the Bill of Quantities, tested and accepted to the satisfaction of the Engineer.

1002.5 Basis of Payment
The quantified items, installed in place shall be the basis for payment, based from the unit bid price for which prices and payments shall constitute full compensation including labor, materials and incidentals necessary to complete this item.

Payment shall be made:

| Pay Item Number | Description | Unit of Measurement |
|---|---|---|
| 1002(a) | GALVANIZED IRON PIPES AND FITTINGS | PIECES/ LENGHT |
| 1002(b) | PLUMBING FIXTURES | SETS |
| 1002(c) | ROOF DRAIN WITH STRAINER | SETS |