

TECHNICAL SPECIFICATIONS

Name of Project: **BSU AND DA-CAR SHEEP AND GOAT MULTIPLIER BREEDER FARM PROJECT**
Location: **BALILI, BSU LA TRINIDAD CAMPUS, LA TRINIDAD, BENGUET**

B.5 - PROJECT BILLBOARD / SIGNBOARD

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)

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 ¾ inch thick marine plywood where the tarpaulin will be attached.

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.

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 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 900(7) - REINFORCED CONCRETE (3000 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 test 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	(ASTM A 185) AASHTO M55 except that the weld shear strength requirement of those specification shall 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 hotdip galvanized in the case of galvanized strands.	

High strength alloy steel bar for post- tensioning shall be proofstressed to 90 % of the granted tensile strength. After proofstressing, 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 percent
Structural steel	ASTM A 36
Steel Pipe for concrete-filled pipe columns	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
- F_{sp} = 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, f_c', 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 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 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 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 – PRE-PAINTED METAL SHEETS

1014.1 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.

1014.2 Material and Construction Requirements

All pre-painted metal sheet and roofing accessories shall be oven baked painted true to profiles indicated on the Plans.

1014.2.1 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.

1014.2.4 Base metal thickness shall correspond to the following gauge designation available locally as follows:

Base Metal Thickness	Designated Gauges
.400 mm thick	Gauge 28
.500 mm thick	Gauge 26

TECHNICAL SPECIFICATIONS

BSU AND DA-CAR SHEEP AND GOAT MULTIPLIER BREEDER FARM PROJECT
Balili, BSU La Trinidad, Campus, La Trinidad, Benguet

.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		
Bottom coat 6.8 microns		
Overall thickness with protective coats		
.400 mm	.428-451 mm	
.500 mm	.532-551 mm	
.600 mm	.638-651 mm	
Length of roofing sheets - available in cut to length long span length up to 18.29 meters		
Special length and thickness are available by arrangements.		

1014.3 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.

1014.3.1 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.

1014.3.2 Installation Procedure

1014.3.2.1 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.

1014.3.2.2 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).

1014.3.2.3 For walling applications follow the procedure for roofing. Allow a minimum end lap of 100 mm (4") for vertical walling.

1014.3.3 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.

1014.3.4 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.

1014.3.5 Anchorage/Fastening

- 1014.3.5.1 Pre-painted steel roofing sheets shall be fastened to the wood purlins with standard length G.I. straps and rivets.
- 1014.3.5.2 For steel frame up to 4.5 mm thick use self-drilling screw No. 12 by 35 mm long hexagonal head with neoprene washer.
- 1014.3.5.3 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.
- 1014.3.5.4 Side lap fastener use self-drilling screw NO.1 0 by 16 mm long hexagonal head with neoprene washer.
- 1014.3.5.5 Valley fastened to lumber and for walling use self-drilling wood screw No. 12 by 25 mm long hexagonal head with neoprene washer.
- 1014.3.5.6 Valleys fastened to steel supports use self-drilling screws, hexagonal head with neoprene washer. Drill size is 5 mm diameter.

1014.3.6 Cutting of Sheets

- 1014.3.6.1 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.
- 1014.3.6.2 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.

1014.3.7 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.

1014.4 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.

1014.3 Method of Measurement		
Pay Item Number	Description	Unit of Measurement
1014	PRE-PAINTED METAL SHEETS	SQ.M.

ITEM SPL.1 – PLASTIC MATTING

SPL.1.1 Description
 This work shall consist of steel structures and plastic floor matting, 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, painting of structural metals, and installation of the plastic floor matting called for in the Special Provision or shown on the Plans.

SPL1.2 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.

SPL.1.3 Method of Measurement

Pay Item Number	Description	Unit of Measurement
SPL.1	PLASTIC FLOOR MATTING	SQ.M.

ITEM SPL.2 – RAILINGS AND PARTITIONS

SPL.2.1 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.

SPL.2.2 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.

SPL.2.3 Method of Measurement

Pay Item Number	Description	Unit of Measurement
SPL.2	RAILINGS AND PARTITIONS	Lump Sum

ITEM 1002 - PLUMBING

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. 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. 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. 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.

1002.3 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

All cast iron soil and drainage pipes shall be pitch 6 mm per 300 mm but in no case flatter than 3mm per 300mm. 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. 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. Vent pipes on roof spaces shall be run as close as possible to under side 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. 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. 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. 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. 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. 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. Vent pipe shall be flashed and made water tight at the roof with ferrule lead sheet. Flushing shall be turned down into pipes. 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. 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.

1002.3.7.2 Water Test on System

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. 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.

1002.3.7.3 Defective Work

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

1002.3.7.4 Disinfection

The entire water distribution system shall be thoroughly flushed and treated with chlorine before it is operated for public use. Disinfection materials shall be liquid chlorine or hypochlerite and shall be introduced in a manner approved as practiced or approved by the Engineer into the water distribution system. After a contact period of not less than sixteen hours, the heavenly chlorinated water shall be flushed from the system with potable water. 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
SPL.4	PLUMBING WORKS	Lump Sum