

The Contractor shall coordinate with other related trades through the Engineer to avoid delay that may arise during the different phases of application of the termite control chemicals.

This work shall be done by a trained personnel with a minimum two (2) years' experience for proper execution of the work of this Specification.

a. Soil Poisoning

There are two (2) methods usually adopted in soil poisoning which are as follows. Other methods as recommended by the manufacturers and approved by the Engineer may also be used.

i. Cordoning

This method is usually adopted when there is no visible evidence of termite infestation. Trenches in concentric circles, squares or rectangles are dug 150 mm to 220 mm wide and at least 1 m apart and applied with Type I working solution at the rate of 8 L/l.m within the cordoned area.

ii. Drenching

When soil show termite infestation, this method shall be applied. The building area shall be thoroughly drenched with Type I working solution at the rate of 24 L/m².

b. Surface preparation

All organic matter, construction debris, rubbish, etc. which could decrease effectiveness of treatment on areas to be treated shall be removed. Water logged foundations shall be treated after drying when the soil is absorbent. For low penetration and sloping sites, surface to be scarified shall be 75 mm deep. Cutting, excavation, leveling and grading shall be completed before starting treatment. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations.

c. Application

Before the application of soil treatment, the Contractor shall coordinate with the Engineer prior to excavating, filling, grading and concreting works.

At the time soil poisoning is to be applied, the soil to be treated shall be in friable condition with low moisture content so as to allow uniform distribution of the toxicant agents. Toxicant shall be applied at least 12 h prior to placement of concrete which shall be in contact with treated materials.

Treatment of the soil on the exterior sides of the foundation walls, grade beams and similar structures shall be done prior to final grading and planting or landscaping work to avoid disturbance of the toxicant barriers by such operations.

Areas to be covered by concrete slab shall be treated before placement of granular fill used as capillary water barrier at a rate of 12 L/m² with Type I

Pay Item Number	Description	Unit of Measurement
1704 (1)a	Embankment (From roadway/structure excavation)	Cubic Meter
1704 (1)b	Embankment (From Borrow)	Cubic Meter
1704 (2)a	Selected Borrow for topping (Case 1)	Cubic Meter
1704 (2)b	Selected Borrow for topping (Case 2)	Cubic Meter
1704 (3)	Earth Berm	Cubic Meter
1704 (4)	Gravel Fill	Cubic Meter

VIII. TERMITE CONTROL WORK

A. Description

This Item shall consist of furnishing and applying termite control chemicals, including the use of equipment and tools in performing such operations in accordance with this Specification.

B. Material Requirements

Termite control chemicals or toxicants shall be able to immediately exterminate termites or create barriers to discourage entry of subterranean termites into the building areas. Chemical or toxicants to be used shall be in accordance with the governing laws and the manufacturer shall be accredited by the Department of Health through Food and Drug Administration (FDA). The toxicants may be classified into the following types and according to use:

Type I. Liquid Termicide Concentrate

This type of toxicant shall be specified for drenching soil beneath foundations of proposed buildings. The concentrate shall be diluted with water in the proportion of 1 L of concentrate material to 65 L of water or as specified by the manufacturer.

Type II. Liquid Termicide Ready Mixed Solution

This type of toxicant which comes in ready mixed solution shall be used as wood preservative by drenching wood surfaces to the point of run-off.

Type III. Powder Termicide

This type of toxicant shall be applied to visible or suspected subterranean termite mounds and tunnels where termites are exterminated through Trophallaxes method (exchange or nourishment between termites while greeting each other upon meeting).

C. Construction Requirements

Before any termite control work is started, thorough examination of the site shall be undertaken by the Contractor so that the appropriate method of soil poisoning can be applied.

accepted. The section must be accepted prior to the placement of the next lift.

j. Dust Control

Adequate dust control must be maintained by the Contractor at all times during the earth-moving operations. Dust shall be controlled exclusively through the use of water unless otherwise indicated in the Contract documents or authorized by the Engineer.

k. Stockpiling

The Contractor shall not place stockpiles at locations where they are subject to erosion. The Contractor shall maintain erosion and drainage control near all stockpiles to the satisfaction of the Engineer and shall ensure that surface drainage does not adversely affect adjacent lands, watercourses or future reclamation sites.

Stockpiles shall not be situated at locations or by methods that will interfere or cause damage to any utilities such as power lines, telephone lines, pipelines, and underground utilities, among others.

Sites shall be cleared to the required dimensions. Topsoil and subsoil shall be separately excavated to the full depth or 300 mm, whichever is greater, and stockpiled separately.

Stockpiles shall not be situated within 30 m of a watercourse or permanent structure or within 4 m of adjacent property boundary unless otherwise permitted in writing by the property owner.

D. Method of Measurement

The quantity of embankment to be paid for shall be the volume of material compacted in place, accepted by the Engineer and formed with material obtained from an approved source.

The volume of embankment materials can be calculated using cross-sectional end area method or by the prismatic formula method with the assistance of computer aided design program.

Material from excavation per Item 802, Excavation which is used in embankment and accepted by the Engineer will be paid under Embankment and such payment will be deemed to include the cost of excavating, hauling, stockpiling and all other costs incidental to the work.

E. Basis Of Payment

The accepted quantities, measured as prescribed in Section 1704.4, Method of Measurement shall be paid for at the Contract Unit Price for each of the Pay 885 Items listed below that is included in the Bill of Quantities. The payment shall continue full compensation for placing and compacting all materials including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this Item.

Payment shall be made under:

landscape features, and the transition to such adjusted slopes shall be gradual. At intersections of cuts and fills, slopes shall be adjusted and warped to flow into each other or into the natural ground surfaces without noticeable break.

g. Serrated Slopes

Cut slopes in rippable material (soft rock) having slope ratios between 0.75:1 and 2:1 shall be constructed so that the final slope line shall consist of a series of small horizontal steps. The step rise and tread dimensions shall be shown on the Plans. No scaling shall be performed on the stepped slopes except for removal of large rocks which will obviously be a safety hazard if they fall into the ditch line or roadway.

h. Earth Berms

When called for in the Contract, permanent earth berms shall be constructed of well graded materials with no rocks having a maximum diameter greater than 25% the height of the berm. When local material is not acceptable, acceptable material shall be imported, as directed by the Engineer.

i. Compacted Berm

Compacted berm construction shall consist of moistening or drying and placing material as necessary in locations shown on the drawings or as established by the Engineer. Material shall contain no roots, sod, or other deleterious materials. Contractor shall take precaution to prevent material from escaping over the embankment slope. Shoulder surface beneath berm will be roughened to provide a bond between the berm and shoulder when completed. The Contractor shall compact the material placed until at least 95 mass percent of the maximum density is obtained as determined by AASHTO T 99, Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 kg Rammer and a 305 mm Drop - Method C. The cross-section of the finished compacted berm shall reasonably conform to the typical cross-section as shown on the Plans.

ii. Uncompacted Berm

Uncompacted berm construction shall consist of drying, if necessary and placing material in locations shown on the Plans or as established by the Engineer. Material shall contain no roots, sod or other deleterious materials. Contractor shall take precautions to prevent material from escaping over the embankment slope.

i. Visual Inspection

Prior to final acceptance, the inspector shall visually inspect the entire section of the compacted embankment. If visual inspection shows that the course is not uniform or that the test values may not be representative of the entire section, additional tests may be performed and deficiencies shall be corrected by the Contractor. Deficiencies identified by visual inspection, such as laminations, dimensional deficiencies, soft areas, etc. shall be corrected before the section will be

Gravel fill shall be constructed below the original ground elevation. The maximum compacted thickness of any layer shall not exceed 150 mm. All subsequent layers shall be spread and compacted in a similar manner. Gravel fill shall be in accordance with the approved Plan and conform to the applicable requirements of earth embankment.

iv. Broken Concrete

Pieces of concrete not exceeding 20 cm in diameter can be mixed if approved by the Engineer. Any exposed rebar on broken concrete pieces shall be cut and disposed of properly.

v. Rock

Density requirements will not apply to portions of embankments constructed of materials which cannot be tested in accordance with approved methods. Embankment materials containing rocks shall be deposited, spread and leveled the full width of the fill with sufficient earth or other fine material so deposited to fill the interstices to produce a dense compact embankment. In addition, one of the rollers, vibrators, or compactors shall compact the embankment full width with a minimum of three (3) complete passes for each layer of embankment.

d. Protection of Embankment During Construction

During the construction, the in-placed embankments shall be maintained in such condition that it will be well drained at all times. Side ditches or gutters emptying from cuts to embankments or otherwise shall be so constructed as to avoid damage to embankments by erosion.

e. Protection of Structure

If embankment can be deposited on one (1) side of adjoining structure, care shall be taken that the area adjacent to the structure shall not be compacted to the extent that it will cause damages against the structure.

When embankment is to be placed on both sides of a concrete structure, operations shall be so conducted that the embankment is always at approximately the same elevation on both sides of the structure unless otherwise specified in the Plans.

Embankment shall not be placed in areas where the materials will be submerged in water. The area shall be pumped dry and any mud or loose material shall be removed.

f. Rounding and Warping Slopes

Rounding except in solid rock, the tops and bottoms of all slopes, including the slopes of drainage ditches, shall be rounded as indicated on the Plans. A layer of earth overlaying rock shall be rounded above the rock as done in earth slopes.

Warping adjustments in slopes shall be made to avoid injury in standing trees or marring of weathered rock, or to harmonize with existing

c. Compaction

i. Compaction Trials

Before commencing the formation of embankments, the Contractor shall submit in writing to the Engineer for approval his proposals for the compaction of each type of fill material to be used in the works. The proposals shall include the relationship between the types of compaction equipment, the number of passes required and the method of adjusting moisture content. The Contractor shall carry out full scale compaction trials on areas not less than 10 m wide and 50 m long as required by the Engineer and using his proposed procedures or such amendments thereto as may be found necessary to satisfy the Engineer that all the specified requirements regarding compaction can be consistently achieved. The compaction equipment shall be equivalent or higher than the required capacity prescribed in the Contract. Compaction trials with the main types of fill material to be used in the works shall be completed before work with the corresponding materials shall be allowed to commence. When embankment dimension is less than 10 m wide and 50 m long, the Engineer may waive the construction of compaction trials. 111 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.

ii. Earth

The Contractor shall compact the material placed in all embankment layers and the material scarified to the designated depth below subgrade in cut sections, until a uniform density of not less than 95 mass percent of the maximum dry density determined by AASHTO T 99, Standard Method of Test for Moisture Density Relations of Soils Using a 2.5 kg Rammer and a 305 mm Drop - Method C, is attained, at a moisture content determined by Engineer to be suitable for such density.

The Engineer shall, during progress of the Work, make density tests of compacted material in accordance with AASHTO T 191, Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method, AASHTO T 205, Soil - Field density test sets: Balloon density apparatus or other approved field density tests, including the use of properly calibrated nuclear testing devices. If, by such tests, the Engineer determines that the specified density and moisture conditions have not been attained, the Contractor shall perform additional work as may be necessary to attain the specified conditions.

At least one group of three (3) in-situ density tests shall be carried out for each 500 m² of each layer of compacted fill.

iii. Gravel Fill

specified before the next layer is placed. However, thicker layer maybe placed if vibratory roller with high compacting 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.

Where embankment is to be constructed across low swampy ground that will not support the mass of trucks or other hauling equipment, the lower part of the fill may be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. Fill material shall be placed in a way it effectively displaces unsuitable material from within unstable area of the proposed embankment.

When excavated material contains more than 25 mass percent of rock larger than 150 mm in greatest diameter and cannot be placed in layers of the thickness prescribed without crushing, pulverizing or further breaking down the pieces resulting from excavation methods, such materials may be placed on the embankment in layers not exceeding in thickness the approximate average size of the larger rocks, but not greater than 600 mm.

Even though the thickness of layers is limited as provided above, the placing of individual rocks and boulders greater than 600 mm in diameter shall be permitted provided that when placed, they do not exceed 1,200 mm in height and provided they are carefully distributed, with the interstices filled with finer material to form a dense and compact mass. Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of earth. Lifts of material containing more than 25 mass percent of rock larger than 150 mm in greatest dimensions shall not be constructed above an elevation 300 mm below the finished subgrade. The balance of the embankment shall be composed of suitable material smoothed and placed in layers not exceeding 200 mm in loose thickness and compacted as specified for embankments.

Dumping and rolling areas shall be kept separate, and no lift shall be covered by another until compaction complies with the requirements of Subsection 804.3.3, Compaction.

Hauling and leveling equipment shall be so routed and distributed over each layer of the fill in such a manner as to make use of compaction effort afforded thereby and to minimize rutting and uneven compaction.

Where shown on the Plans or directed by the Engineer, the surface of the existing ground shall be compacted to a depth of 150 mm and to the specified requirements of this Item.

Where provided on the Plans and Bill of Quantities the top portions of the roadbed in both cuts and embankments, as indicated, shall consist of selected borrow for topping from excavations.

b. Methods of Construction

Where there is evidence of discrepancies on the actual elevations and that shown on the Plans, a preconstruction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the Engineer to serve as basis for the computation of the actual volume of the embankment materials. 109

When embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built $\frac{1}{2}$ of the width at a time, the existing slopes that are steeper than 3:1 when measured at right angles to the roadway shall be continuously benched over those areas as the work is brought up in layers. Benching will be subject to the Engineer's approval and shall be of sufficient width to permit operation of placement and compaction equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus excavated shall be placed and compacted along with the embankment material in accordance with the procedure described in this Section.

Unless shown otherwise on the Plans or Special Provisions, where an embankment of less than 1.2 m below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing, scarifying, or steeping to a minimum depth of 150 mm except as provided in Subsection 802.2.2, Conservation of Topsoil. This area shall then be compacted as provided in Subsection 804.3.3, Compaction. Sod not required to be removed shall be thoroughly disc harrowed or scarified before construction of embankment. Wherever a compacted embankment containing granular materials lies within 900 mm of the subgrade, such old embankment shall be scarified to a depth of at least 150 mm whenever directed by the Engineer. This scarified material shall then be compacted as provided in Subsection 804.3.3, Compaction.

When shoulder excavation is specified, the shoulders shall be excavated to the depth and width shown on the Plans. The shoulder material shall be removed without disturbing the adjacent existing base course material, and all excess excavated materials shall be disposed of as provided in Subsection 802.2.3, Utilization of Excavated Materials. If necessary, the areas shall be compacted before being backfilled.

Embankment of earth material shall be placed in horizontal layers not exceeding 200 mm, loose measurement, and shall be compacted as

Impact in the Los Angeles Machine shall not exceed 40 mass percent.

The gravel fill material grading requirements shall conform to Table 804.1.

Table 804.1 Grading Requirements

Sieve Designation		Mass Percent Passing
Standard, mm	Alternate US Standard	Grading A
63.5	2 ½"	100
50	2"	65 - 100
25.0	1"	50 - 85
4.75	No. 4	26 - 44
0.425	No. 40	16 max
0.075	No. 200	9 max

- iii. Rock fill material shall be hard, sound and durable material, free from seams, cracks, and other defects tending to destroy its resistance to weather. Specific gravity of rock fill materials shall be above 2.40.

b. Unsuitable Material

Materials that are not acceptable for use are the following:

- i. Organic soils such as peat and muck.
- ii. Soils with liquid limit exceeding 80 and/or plasticity index exceeding 55.
- iii. Soils with a natural water content exceeding 100%.
- iv. Soils with very low natural density, 800 kg/m³ or lower.
- v. Materials containing detrimental quantities of organic materials, such as grass, roots, sewerage, and other materials that cannot be properly compacted as determined by the Engineer.

C. Construction Requirements

a. General

Prior to placing of embankment materials, all necessary clearing and grubbing in that area shall have been performed in conformity with Item 800, Clearing and Grubbing.

Embankment construction shall consist of constructing embankments, including preparation of the areas upon which they are to be placed; the construction of dikes within or adjacent to any structures; the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits, and other depressions within the area.

Embankments and backfills shall contain no muck, peat, sod, roots or other deleterious matter. Rocks, broken concrete or other solid, bulky materials shall not be placed in embankment areas where piling is to be placed or driven.

Pay Item Number	Description	Unit Of Measurement
1702 (1)a	Structure Excavation (Common Soil)	Cubic Meter
1702 (1)b	Structure Excavation (Soft Rock)	Cubic Meter
1702 (1)c	Structure Excavation (Hard Rock)	Cubic Meter
1702 (2)a	Excavation (Common Soil)	Cubic Meter
1702 (2)b	Excavation (Soft Rock)	Cubic Meter
1702 (2)c	Excavation (Hard Rock)	Cubic Meter
1702 (3)	Excavation ordered below Plan elevation	Cubic Meter
1702 (4)a	Shoring, cribbing and drain excavation (Shoring)	Lump Sum
1702 (4)b	Shoring, cribbing and drain excavation, (Cribbing/ Cofferdamming)	Lump Sum
1702 (5)a	Pipe culverts and drain excavation (Common Soil)	Cubic Meter
1702 (5)b	Pipe culverts and drain excavation (Soft Rock)	Cubic Meter
1702 (5)c	Pipe culverts and drain excavation (Hard Rock)	Cubic Meter
1702 (6)	Trimming Works	Square Meter

VII. EMBANKMENT

A. Description

This Item shall consist of the construction of embankment using suitable materials of various composition and compacted in accordance with this Specification and in conformity with the lines, grades and dimensions shown on the Plans or established by the Engineer.

B. Material Requirements

a. Suitable Material

Embankments shall be constructed of suitable materials and materials meeting with the following requirements:

- i. Selected Borrow -- soil of such gradation that all particles will pass a sieve with 75 mm square openings and not more than 15 mass percent will pass the 0.075 mm (No. 200) sieve, as determined by AASHTO T 11, Standard Method of Test for Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing. The material shall have a plasticity index of not more than six (6) as determined by AASHTO T 90, Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils and a liquid limit of not more than 30 as determined by AASHTO T 89, Standard Method of Test for Determining the Liquid Limit of Soils.
- ii. Gravel fill shall consist of crushed, partially crushed, or naturally occurring granular material. The abrasion loss as determined by AASHTO T 96, Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and

the original Contract Plans, unless the Bill of Quantities contains a pay item for excavation ordered below the elevations shown on the Plans for individual footings.

b. Shoring, Cribbing and Related Work

Shoring, cribbing and related work whenever included as a pay item in Bill of Quantities shall be paid for at the lump sum bid price. This work shall include furnishing, constructing, maintaining, and removing any and all shoring, cribbing, cofferdams, caissons, bracing, sheeting, water control, and other operations necessary for the acceptable completion of excavation included in the work of this Subsection, to a depth of 1.5 m below the lowest elevation shown on the Plans for each separable foundation structure.

c. Trimming Works

Trimming shall include all activities associated with the excavation of any material, the haulage of material, and trimming of batters that conform to the lines, grades, cross sections and dimensions shown on the Plans.

D. Basis Of Payment

The accepted quantities, measured as prescribed in Section 1702.3, Method of Measurement shall be paid for at the Contract Unit Price for each of the particular pay items listed below that is included in the Bill of Quantities. The payment shall constitute full compensation for the removal and disposal of excavated materials including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this Item, except as follows:

- A. Any excavation for footings ordered at a depth more than 1.5 m below the lowest elevation shown on the original Contract Plans shall be paid for as provided in the Part K of Volume I Requirements and Conditions of Contract, unless a pay item for excavation ordered below plan elevation appears in the Bill of Quantities.
- B. Concrete will be measured and paid for as provided under Item 900, Structural Concrete. The quantity of structural concrete to be paid for shall be the final quantity placed and accepted in the completed structure. No deduction shall be made for the volume occupied by pipe less than 100 mm in diameter or by reinforcing steel, anchors, conduits, weep holes or expansion joint materials.
- C. Any excavation or borrow excavation required in excess of the quantity excavated for structures shall be measured and paid for as provided under Item 1702, Excavation.
- D. Shoring, cribbing, and related work required for excavation ordered more than 1.5 m below plan elevation shall be paid for in accordance with Part K.

Payment shall be made under:

appearance of the structure. No excavated materials shall be deposited at any time so as to endanger the partly finished structure.

d. Trimming Works

The excavation shall conform to the lines, grades, cross sections and dimensions shown on the Plans. The Engineer shall order the removal of any soft spots, debris or organic material exposed when excavated areas shall have been trimmed to finished formation levels. Subgrade in earth shall be trimmed cut to an even surface free of loose material and compact as specified by the Engineer to the density prescribed in in the Plans.

i. Trimming and Finishing of Surfaces

Unless otherwise specified, all areas within the limits of clearing and outside the limits of earthworks shall be graded to an even surface. Ridges shall be trimmed and depressions shall be filled as necessary to produce a surface which will drain freely and is suitable for the operation of tractor mounted mowers. Batters in cut and fill shall be trimmed to shapes shown on drawings. Cut and fill batters shall be trimmed as specified in the Plans.

C. Method of Measurement

a. Structure Excavation

The volume of excavation to be paid for shall be the number of cubic meters measured in original position of material acceptably excavated as shown on the Plans or as directed by the Engineer, but in no case, except as noted, shall any of the following volumes be included in the measurement for payment:

- i. The volume outside of vertical planes 450 mm outside of and parallel to the neat lines of footings and the inside walls of pipe and pipe-arch culverts at their widest horizontal dimensions.
- ii. The volume of excavation for culvert and sections outside the vertical plane for culverts stipulated in (1) above.
- iii. The volume outside of neat lines of underdrains as shown on the Plans, and outside the limits of foundation fill as ordered by the Engineer.
- iv. The volume included within the staked limits of the excavation, contiguous channel changes, ditches, and the like, for which payment is otherwise provided in the Specification.
- v. Volume of water or other liquid resulting from construction operations and which can be pumped or drained away.
- vi. The volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed ground.
- vii. The volume of any material rehandled, except that where the Plans indicate or the Engineer directs the excavation after embankment has been placed and except that when installation of pipe culverts by the imperfect trench method specified in Subsection 1718.3.7, Imperfect Trench of Item 1718, Pipe Culverts and Storm Drains is required, the volume of material reexcavated as directed will be included.
- viii. The volume of excavation for footings ordered at a depth more than 1.5 m below the lowest elevation for such footings shown on

unsuitable material and backfill with approved granular material. This foundation fill shall be placed and compacted in 150 mm layers up to the foundation elevation.

When foundation piles are used, the excavation of each pit shall be completed before the piles are driven and any placing of foundation fill shall be done after the piles are driven. After the driving is completed, all loose and displaced materials shall be removed, leaving a smooth, solid bed to receive the footing.

iii. Pipe Culverts

The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 300 mm or 4 mm for each 100 mm of fill over the top of pipe, whichever is greater, but not to exceed three-quarters of the vertical inside diameter of the pipe. The width of the excavation shall be at least 300 mm greater than the horizontal outside diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 150 mm in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, such unstable soil under the pipe and for a width of at least one diameter on each side of the pipe shall be removed to the depth directed by the Engineer and replaced with approved granular foundation fill material properly compacted to provide adequate support for the pipe, unless other special construction methods are called for on the Plans. 102

The foundation surface shall provide a firm foundation of uniform density throughout the length of the culvert and, if directed by the Engineer, shall be cambered in the direction parallel to the pipe centerline.

Where pipe culverts are to be placed in trenches excavated in embankments, the excavation of each trench shall be performed after the embankment has been constructed to a plane parallel to the proposed profile grade and to such height above the bottom of the pipe as shown on the Plans or directed by the Engineer.

c. Utilization of Excavated Materials

All excavated materials, so far as suitable, shall be utilized as backfill or embankment. The surplus materials shall be disposed of in such manner as not to obstruct the stream or otherwise impair the efficiency or

cofferdams, and furnishing the materials therefore, and the subsequent removal of cribs and cofferdams and the placing of all necessary backfill.

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 shall be made for classification of different types of material encountered.

B. Construction Requirements

a. 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 800, Clearing and Grubbing.

b. Excavation

i. General, All Structures

The Contractor shall notify the Engineer sufficiently in advance at 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. 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. 101 Boulders, logs, and other objectionable materials encountered in excavation shall be removed.

After each excavation is completed, the Contractor shall notify the Engineer to that effect and no footing, bedding material or pipe culvert shall be placed until the Engineer has approved the depth of excavation and the character of the foundation material.

ii. Structures Other than Pipe Culverts

All rock or other hard foundation materials shall be cleaned of all loose materials, and cut to a firm surface, either level, stepped, or serrated as directed by the Engineer. All seams or crevices shall be cleaned and grouted. All loose and disintegrated rocks and thin strata shall be removed. When the footing is to rest on material other than rock, excavation to final grade shall not be made until just before the footing is to be placed. When the foundation material is soft or mucky or otherwise unsuitable, as determined by the Engineer, the Contractor shall remove the

to the posts, with stretcher bands spaced at a maximum of 355 mm and in a manner permitting adjustment of the fabric tension.

If the Contractor selects the option of using pieces, roll-formed sections, the fence fabric shall be integrally woven into the fabric loops on the end, corner, pull and gate posts. The fabric shall be attached to the end, corner and line posts as shown on the Plans.

b. Chain Link with Top Tension Wire

The construction details specified in Chain-Link Fencing with top Rail shall apply with the following modifications:

- i. Top tension wire shall be installed as shown on the Plans or as directed by the Engineer.
- ii. All posts shall be spaced equidistant in the fence line on a maximum of 2.44 m on center, except that a 3 m spacing will be permitted on concrete barriers.
- iii. Additional pull posts shall be placed at locations indicated on the Plans. Brace assemblies shall be installed at each intermediate post as indicated on the Plans or Standard Sheets.

c. Vinyl Coated Chain-link Fencing on Plastic Coated Frame

The construction details specified on Chain-Link Fencing with Top Rail or ChainLink Fencing with Top Tension Wire shall apply with the following addition: If any of the resin-clad material specified under Item that has the protective resin coating is damaged that impairs its effectiveness to prevent corrosion of the base material, the Contractor shall repair such parts by applying one coat of an approved compound of color to match the original material.

d. Fence Gates

The Contractor shall construct metal fence gates of the type and size as indicated on the Plans, and in the location shown or ordered by the Engineer. Upon removal, fence gates shall become the property of the Contractor and shall be removed from the project site.

D. Method Of Measurement

This work under this Item shall be measured by lump sum of temporary fence installed as measured along the top of the fencing, including gates, center to center of end posts erected in place and accepted.

VI. STRUCTURE EXCAVATION

A. Description

This Item shall consist of the necessary excavation for foundation of buildings, culverts, underdrains, and other structures not otherwise provided for in the Specifications. Except as otherwise provided for pipe culverts, the backfilling of completed structures and the disposal of all excavated surplus materials, shall be in accordance with the Plans and this Specification.

This Item shall include necessary diversion of live streams, dewatering, pumping, draining, sheeting, bracing, and the necessary construction of cribs and

the concrete barrier is furnished in lengths exceeding 3 m, it will be necessary for the Contractor to provide an additional hole at the center of the section to permit the installation of an intermediate post. Line posts, corner and end posts on grade, and gate posts shall be installed in accordance with the Plans. Heights of the posts and fencing shall conform to the dimensions shown on the Plans. At locations where breaks in a run of fencing are required, or at interactions with existing fences, appropriate adjustments in post spacing shall be made to conform to the requirement for the type of closure indicated. When the Plans require that the posts, braces, or anchors be embedded in concrete, the Contractor shall install temporary guys or braces, as may be required to hold the posts in proper position until such time as the concrete has set sufficiently to hold the posts. Unless otherwise permitted, no materials shall be installed on posts or strain placed on guys or bracing set in concrete until seven days elapsed from the time of placing the concrete. All posts shall be set vertically and to the required grade and alignment. Cutting off the tops of the posts will be allowed only with the approval of the Engineer and under conditions specified by the Engineer. The fence fabric of the size and type required shall be firmly attached to the posts and braces in the manner indicated. All fence fabric shall be stretched taut and installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of fence fabric not less than 50 mm nor more than 150 mm from the ground surface. Grading shall be performed where necessary to provide a neat appearance. Line posts shall be spaced equidistantly in the fence line at the spacing shown on the Plans or as directed by the Engineer. The end, corner, and intermediate posts shall be placed at the locations indicated on the Plans or where directed by the Engineer, and shall be braced as shown on the Plans. When chain-link fence is on a long curve, intermediate posts shall be evenly spaced so that the strain of the fence will not bend the line posts. All end, corner, and intermediate posts shall be set plumb in concrete bases of the depth and diameter shown on the Plans. The Contractor shall have the option of setting the line posts in concrete bases or using methods of driving and anchoring specified by the fence manufacturer and approved by the Engineer.

a. Chain Link Fencing with Top Rail

Posts shall be set so they are equidistant with a maximum of three (3) meters on center.

All top rails shall pass through the base of the post caps and shall form a continuous brace from end to end of each stretch of fence. Top rail lengths shall be joined with sleeve couplings with expansion sleeves provided at 30 m intervals. Top rails shall be securely fastened to end posts by means of approved rail end connectors. Horizontal braces shall be provided at all intermediate posts, midway between the top rail and ground as shown on the Plans.

Diagonal truss rods shall be installed with the horizontal braces as indicated in the Plans.

Fence fabric shall be installed approximately 50 mm above the ground level and securely fastened along the bottom and to all braces, top rails, line and pull posts, at the intervals indicated on the Plans. The fabric shall be secured to all end, corner, and gate posts with stretcher bars fastened

1. Flush Type Hollow Core Doors Flush type hollow core doors shall be adequately framed with stiles and top and bottom rails having a minimum thickness of 44 mm and width of 75 mm. Two (2) intermediate rails at least 44 mm wide shall be provided for stiffness. The stiles and the top and bottom rails shall be rabbeted at least 10 mm wide to receive the 6 mm thick plywood veneer. A lock block shall be provided at each stile, long enough to connect to the two (2) intermediate rails and at least 75 mm wide for mounting the lockset. The plywood veneer shall be glued and nailed to the framing with 25 mm long finishing nails space at not more than 150 mm on centers.

2. Flush Type Solid Core Doors Flush type solid core doors shall be fabricated in the same manner as the hollow core type except that spaces between stiles and rails shall be filled and fitted with wood blocks of the same species and of uniform thickness thinner by about the thickness of the plywood veneers. The filler blocks shall be secured to either stiles or rails by nails. Stiles and rails of flush type doors shall be joined by means of blind mortise and tenon joint, tightly fitted, glued and locked with bamboo pin 5 mm round.

3. Panel Doors Rails with a minimum thickness of 44 mm and width of 140 mm. Rails shall be framed to stiles by mortise and tenon joints. Rabbets or grooves of stiles and rails to receive panels shall be 6.5 mm wide and 20 mm deep. Integral mouldings formed on both faces of stiles and rails framing the panels shall be true to shape and well defined. Intersections of mouldings shall be mitered and closely fitted. Panels of the same species and having a minimum thickness of 20 mm shall be beveled around its edges up to a minimum width of 50 mm, both faces. The beveled edges shall closely fit into the grooves of stiles and rails, but free to move to prevent splitting when shrinkage occurs.

4. Window Sashes with Glass Panes or Wood Panels Window sashes shall be fabricated in conformity with the design, size and type of installation shown on the Plans. Unless otherwise shown on the 268 Plans, stiles and rails shall be Tanguile with minimum thickness of 30 mm and width of 70 mm. Jointing of stiles and rails shall be mortise and tenon secured with glue and bamboo pin. Stiles and rails shall be rabbeted at the exterior face for mounting glass panes or wood panels. Integral mouldings formed as frames for panes or panels shall be true to shape, sharply defined and mitered at joints. Separate mouldings of the same design shall be provided for fixing glass panes and wood panel from the outside.

5. Window Sashes with Capiz Shells Stiles and rails shall be of the same sizes specified under Subsection 1010.3.1(4), Window Sashes with Glass Panes or Wood Panels, and assembled with mortise and tenon joint. Unless otherwise indicated on the Plans, lattices for framing Capiz shall be tanguile, 8 mm thick and 15 mm wide, spaced at not more than 60 mm on centers bothways. Grooves 2 mm wide and 5 mm shall be made at sides of lattices to receive the preformed Capiz shells. The lattices shall be assembled with half lap joints at their intersections and the assembled lattices containing the Capiz shells shall be framed into the stiles and rails. Selected Capiz shells shall be washed to remove dirt and blemishes and dried under the sun for bleaching effect. Capiz shells shall be cut square to required sizes with sharp bench cutter to produce non-serrated and nonpeeling edges.

6. Sliding Type Window Sashes Stiles of sliding type window sashes shall be framed to the top and bottom rails with mortise and tenon joints. Tenons shall be formed on the stiles. Joints shall be tightly fitted, glued and locked with bamboo pins. Top and bottom rails shall be 10 mm wider than the stiles. Top rails shall be rabbeted to form a tongue flush with the outer face, with width of 8 mm and height of 10 mm. The stiles and rails shall be rabbeted as specified under Subsection 1010.3.1(4), Window Sashes with Glass Panes or Wood Panels to receive glass panes or wood panels.

7. Awning Type Window Sashes Tenons of rails shall be fitted into the mortises formed on the stiles and the joints glued and locked. The stiles and rails shall be rabbeted as specified under Subsection 1010.3.1(4), Window Sashes with Glass Panes or Wood Panels for mounting of glass panes. Series of sashes to be installed vertically shall have their meeting rails rabbeted for half lapping when in closed position.

8. Casement Type Window Sashes Rails of casement type window sashes shall be fitted to stiles with mortise and tenon joint. Tenons shall be formed in the rails. Meeting rails shall be rabbeted to provide for half lapping when in closed position. The stiles and rails shall be rabbeted as specified under Subsection 1010.3.1(4), Window Sashes with Glass Panes or Wood Panels for mounting of glass panes or wood panels.

9. Door and Window Frames Framing of the species specified under Item 1003, Carpentry and Joinery Works, shall be fabricated in conformity with the profile and sizes as shown on the Plans. Frames shall be assembled with tightly fitted tongue and groove joint mitered at both sides, and nailed. The assembled frames shall be finished square and flat on the same plane. Assembled frames shall be braced temporarily to prevent their distortion during delivery to the site and installation.

C. Installation

1. Frames shall be set plumb and square in concrete/masonry work or framework of walls or partitions. Frames set in concrete or masonry shall be provided with two (2) rows of common wire nails 100 mm long for anchorage. The nails shall be staggered and spaced at 300 mm on center along each row. Frame set in concrete shall be installed in place prior to concrete work. Frames set in masonry work may be installed after laying of hollow concrete blocks, bricks or adobe. Space between frames and masonry shall be fully filled with cement mortar proportioned 1:3.
2. Hinged Doors Hinged doors, whether panel or flush type with standard height of 2,100 mm and width of not more than 900 mm shall be hung with four (4) loosepin butt hinges, 100 mm x 100 mm. Swing out exterior doors shall be hung with four (4) fast-pin butt hinges. Two (2) hinges shall be fitted 150 mm from top and bottom edge of door. The other two (2) hinges shall be fitted at third points between top and bottom hinges. Care should be taken to ensure that the hinges are fitted such that their pins are aligned for ease of pin insertion and smoothness of operation. For added smoothness pins should be lightly greased. Hammering of hinges to attain proper alignment shall not be allowed. For wider and heavier doors, such as Narra panel doors, an additional hinge shall be fitted 100 mm below the top hinge to counteract the door tilting action. Mounting screws shall be screwed in place in their

entire length, not forced into place by hammering. Hammering of screw into place shall not be permitted.

3. Sliding Doors Overhead tracks, standard, locally manufactured as per Plans shall be installed level and mounting bracket secured in place with lag screws 270 supplied with the set. Bracket shall be spaced 1,000 mm on centers. Hangers, two (2) each per door leaf, shall be perfitted and bolted to the door rail. For panel doors, the hangers shall be centered on the door stiles. For flush doors, the hangers shall be centered 100 mm from the edges of the door. If there is no adequate space for installing the door with its attached rollers, through either end of the track the perfitted hangers shall be disassembled for connection to the rollers. After installation on the track, set the door plumb and in alignment by means of the adjustment mechanism integrated with the roller assembly.
4. Lock Installation Locks of doors shall be fitted at the same height, centered 1000 mm above the finished floor level. Locks shall be installed in conformity with the templates and instructions supplied with locksets. Holes for mounting locks shall be properly formed to provide snug fit and rigid attachment of the locks to the doors. Strike plates shall be fitted on the door frame in true alignment with the lock latch.
5. Sliding Type Window Sashes Sashes shall be trimmed to fit height of opening. A clearance of 2 mm shall be provided between the tongue's base at the top rail and the bottom of the window head. The same clearance shall be provided between the sash tongue and the groove at the window head. Paraffin wax shall be applied to contacts of sliding surfaces. The bottom rails shall be fitted with standard brass guided spaced 75 mm from both ends of the rail, mounted flush with the inner face and secured with three (3) brass screws each guide.
6. Casement Type Window Sashes Sashes shall be trimmed to fit size of opening, with provision for half lapping of meeting stiles. Right side sash shall lap onto the left side sash. Sashes shall be fitted with two (2) brass-plated narrow hinges, 50 mm x 75 mm, spaced 150 mm from top and bottom of stiles. In lieu of hinges, sashes maybe hung with cadmium-plated steel casement adjusters 200 mm long, subject to prior approval of the Engineer. The top and bottom rails of casement type window sashes shall be milled to provide for the installation of adjusters.
7. Awning Type Window Sashes Installation of awning type sashes shall be by means of casement adjusters specified under Subsection 1010.3.2 (6), Casement Type Window Sashes. 1010.4 Method of Measurement Frames of doors and windows shall be measured on the basis of number of sets completely installed and accepted by the Engineer. 271 Doors and windows shall be measured based on the number of square meters or lump sum including its hardware involved in the completed and accepted installation. Payment per square meter or in lumpsum shall include cost of required hardware and all incidental expenses, but exclusive of locks for doors. Locks shall be paid for per set completely installed. 1010.5 Basis of Payment Payment for completely installed and accepted wooden doors and windows shall be based on actual measurement and the corresponding contract unit price thereof. Payment based on Contract Unit Price shall constitute full compensation. Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1010 (1)	Frames (Jambs, Sills, Head Transoms and Mullions)	Set
1010 (2)a	Doors (Flush)	Square Meter
1010 (2)b	Doors (Wood Panel)	Square Meter
1010 (2)c	Doors (Glass Panel)	Square Meter
1010 (3)	Window Sashes	Square Meter
1010 (4)	Wooden Doors and Windows	Lump sum

XIV. ALUMINUM GLASS DOORS

A. Description

This item shall consist of furnishing all aluminum glass door materials, labor, tools and equipment required in undertaking the proper installation in accordance with the Plans and this Specification.

B. Material Requirements

Frame and panel members shall be fabricated from extruded aluminum sections true to details with clean, straight, sharply defined profiles and free from defects impairing strength or durability. Extruded aluminum sections shall conform to the Specification requirements as defined in ASTM B 211, Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

Screws, nuts, washers, bolts, rivets and other miscellaneous fastening devices shall be made of non-corrosive materials such as aluminum, stainless steel, or other material equivalent.

Hardware for fixing and locking devices shall be closely matched to the extruded aluminum section and adaptable to the type and method of opening.

Vinyl weatherstrip shall be first class quality flexible vinyl forming an effective seal and without adverse deformation when installed.

Pile weather strip shall be silicon treated and free from residual wetting agents and made of soft fine hair as on wool, fur, among others.

Glazing shall conform to the requirement specified in Item 1012, Glass and Glazing.

C. Construction Requirements

For all assembly and fabrication works, the cut ends shall be true and accurately jointed, free of burrs and rough edges. Cut-out recesses, mortising, grinding operation for hardwares shall be accurately made and properly reinforced when necessary.

a. Installation Procedure

The width for door stiles and top, bottom and center rails shall be as shown on the Plans.

Main frame shall consist of head sill and jamb stiles specifically designed and machined to interfit and be joined at corners with self-threading screws

Frame sill shall be stepped and sloped with offset weep holes for efficient drainage to the exterior.

Door panel shall be accurately joined at corners, assembled and fixed rigidly to ensure weather tightness.

Aluminum glass door and main frame shall be installed in a prepared opening to be set plumb, square, level and true to details.

All joints between metal surface and masonry shall be fully caulked to ensure weather tightness.

Sliding type door panel shall be equipped with concealed roller overhead tracks with bottom guide.

Double action type door panel shall be equipped with heavy duty hinges that will control the door leaf in a close or open position.

Weatherstrip shall be furnished on edges at the meeting stiles of doors. Where aluminum is to be in contact with steel concrete cinder, block, tile, plaster or other similar masonry construction the aluminum surface shall be back painted before erection with a bituminous paint.

b. Shop Finish

Exposed aluminum surfaces shall be electro type hard coats.

c. Protection

All aluminum parts shall be protected adequately to ensure against damage during transit and construction operations.

Aluminum parts in contact with steel members shall be properly insulated by a coat of zinc chromate primer applied to the steel or by application of bituminous paint.

d. Cleaning

The Contractor is responsible for protecting all entrance units during construction, as well as the removal of protective materials and cleaning of aluminum surfaces.

Pay Item Aluminum shall be thoroughly cleaned with plain water mixed with kerosene or gasoline and then wipe surfaces using clean cotton fabric. No abrasive cleaning agents shall be permitted.

D. Method Of Measurement

Aluminum glass door, fully equipped with fixing accessories and locking devices shall be measured by square meter or by lump sum based on what is actually installed as shown on the Plans and approved by the Engineer.

E. Basis Of Payment

The area in square meter or in lump sum of aluminum glass doors installed including main frame and ready for service as provided in Section 1007.4, Method of Measurement shall be the basis of payment based on the unit bid or Contract Unit Price.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1007(1)a	Aluminum Framed Glass Door, Sliding Type	Square Meter
1007(1)b	Aluminum Framed Glass Door, Swing Type	Square Meter
1007(2)	Aluminum Framed Glass Door	Lump Sum

XV. ALUMINUM GLASS WINDOWS

A. Description

This Item shall consist of furnishing all aluminum glass window materials, labor, tools and equipment required in undertaking the proper installation in accordance with the Plans and this Specification.

B. Material Requirements

Frame and panel members shall be fabricated from extruded aluminum section true to details with clean, straight, sharply defined profiles and free from defects impairing strength or durability. Extruded aluminum section shall conform to the specification requirements defined in ASTM B211, Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire. Screws, nuts, washers, bolts, rivets and other miscellaneous fastening devices shall be made of non-corrosive materials such as aluminum, stainless steel, etc. Hardware for fixing and locking device shall be closely matched to the extruded aluminum section and adaptable to the type and method of opening. Weather strip shall be first class quality flexible vinyl forming an effective seal and without adverse deformation when installed. Glazing shall conform to the requirements specified in Item 1012, Glass and Glazing.

C. Construction Requirements

For all assembly and fabrication works the cut end shall be true and accurate, free of burrs and rough edges. Cut-outs recesses, mortising and grinding operation for hardware shall be accurately made and properly reinforced. Main frame shall consist of head, silt and jamb. All joints between metal surface and masonry shall be fully caulked. Aluminum parts in contact with steel members shall be properly insulated by a coat of zinc chromate, primer/bituminous paint applied to the steel surface. Weather strip shall be furnished on edges at the meeting stiles. Shop drawings which include window schedules, sections and multiple window assembly details shall be submitted to the Engineer for approval before installation.

a. Window Sash

Window panel shall be jointed at corners with miter and fixed rigidly to ensure weather tightness. Corners should be fastened with corrosion resistant screws and aluminum corner angles sealed with an acrylic sealant. All fixed glass is exterior glazed and all sashes are marine glazed with flexible PVC glazing. The fixed glazing shall be removed without disassembly of a sash. The vents will need to be disassembled to replace the glazing.

b. Sliding Window

Sliding windows shall be provided with nylon sheave. Sliding panels shall be suspended with concealed roller overhead tracks with bottom guide pitch outward and slotted for complete drainage. The sliding panels shall be provided with interior handles. The locking device shall be a spring loaded extruded latch that automatically engages special frame hips.

c. Casement Window

Casement window type shall be provided with two (2) hinges fabricated from extruded aluminum alloy. They shall open on stay arms having adjustable sliding friction shoes to control window panel operations. Locking device shall be one arm action handle for manual operations complete with strike plate.

d. Awning Window

The perimeter frame of the awning window type can be supplied with nailing fins. Awning window units to be installed in prepared openings in accordance with the manufacturer's recommendations and installation drawings. Frames must be securely fastened, set plumb and level without twisting, bowing or distortion

e. Fixed Type

Fixed type window members including any mullions, shall be made of aluminum. Secondary members such as friction tabs, shoes, and weather stripping guides, shall also be made of aluminum or a compatible material. The tilt housing and latch units shall be mechanically anchored to the sash rails. The latches shall be spring loaded and afford positive lock into the jamb profile. In a tilted position, the sash shall be removable to the interior.

f. Shop Finish

Exposed aluminum surfaces shall be electrolyte hand coats such as anodize, satin, powder coated, among others.

g. Protection

All aluminum parts shall be protected adequately to ensure against damage during transit and construction phase.

h. Cleaning

The Contractor does not only protect all entrance units during the construction phase but shall also be responsible for removal of protective materials and clearing the aluminum surface including glazing before work is accepted by the Engineer. Aluminum shall be thoroughly cleaned with aluminum and glass cleaning solution and then wipes surface using clean cloth rags. No abrasive cleaning materials shall be permitted in cleaning surface.

D. Method Of Measurement

Aluminum glass window fully equipped with fixing accessories and locking devices shall be measured in lump sum or square meters actually installed in place and accepted to the satisfaction of the Engineer.

E. Basis Of Payment

The area of aluminum glass windows in square meters ready for service as provided in the Bill of Quantities shall be the basis of payment based on the unit bid or Contract Unit Price which price and payment constitute all materials, labor including incidentals.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1008 (1)a	Aluminum Glass Windows, Sliding Type	Square Meter
1008 (1)b	Aluminum Glass Windows, Casement Type	Square Meter
1008 (1)c	Aluminum Glass Windows, Awning Type	Square Meter
1008 (1)d	Aluminum Glass Windows, Fixed Type	Square Meter
1008 (2)	Aluminum Glass Windows	Lump Sum

XVI. PRE-PAINTED METAL SHEETS

A. 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 in accordance with the Plans and this Specification.

B. Material Requirements

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

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 Hot-dip Metallic Coated Steel Sheets for Roofing - Specification. Profile section in identifying the architectural moulded rib to be used is as follows: Regular corrugated, Quadrib, Tri-wave, Rib-wide, Twin-rib, and others. Desired color shall be subject to the approval of the Engineer. Gutters, Valleys, Flashings Hip and Ridge roll shall be fabricated from gauge 24 (0.60 mm thick) cold-rolled plain galvanized iron sheets specially tempered steel. Profile section shall be as indicated on the Plans. Fastening hardware shall be of galvanized iron straps, rivets or J-bolts. G.I. straps are of 0.50 mm thick x 16 mm wide x 267 mm long (gauge 26 x 5/8" x 10-1/2") and standard rivets. Base metal thickness shall correspond to the following gauge designation available locally as follows:

1. Coating thickness

Protective Coatings	Thickness (Coating Mass)
Zinc	14 microns (100 g/m ²)
55% Aluminum Zinc	14 microns (50 g/m ²)
Zinc-5% Aluminum	14 microns (95 g/m ²)
Paint coatings	
Top coat	15.20 microns
Bottom coat	6.8 microns

2. Overall thickness with protective coats

Nominal thickness (mm)	Thickness Range
0.20	0.16 – 0.25
0.30	0.26 – 0.35
0.40	0.36 – 0.44
0.50	0.45 – 0.54

Nominal thickness (mm)	Thickness Range
0.60	0.55 – 0.64
0.70	0.65 – 0.74
0.80	0.75 – 0.86

Note: Nominal thickness refers to the Total Coated Thickness (TCT) and defined as the sum of the Base Metal Thickness (BMT) and coating thickness as per PMS 67.

C. Construction Requirements

Before any installation work is commenced, the top face of the purlins should be checked for proper alignment. Correct the alignment as necessary in order to have the top faces of the purlins on an even plane.

D. 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.

E. Installation Procedure

The laying of the roofing panels should begin on the end of the building away from the prevailing wind so that the side-lap seams face away from the prevailing wind-driven rain thus providing additional security against water penetration. 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. Fasteners should have corrosion resistance at least equivalent to the expected life of the base material. 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). Pre-painted metal sheet should not come in direct contact with wet concrete. Concrete's high alkalinity attacks the aluminum, causing the coating to peel. It shall also not be placed in contact with copper, lead, or the water run-off. Electrochemical reaction between these elements and the aluminum-zinc alloy coating will lead to premature corrosion of the coating. For walling applications follow the procedure for roofing and allow a minimum end lap of 100 mm for vertical walling. For panel lapping, requirements depend on the product installation guide of a specific type of prepainted metal sheet as per approval of the Engineer. Provide sealant,

butyl tape or caulking along the lap edge to prevent any leaking. Specifications of the sealant and butyl tape shall be as per manufacturer's recommendation per Engineers approval.

F. 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. Always begin flashing installation from bottom and work up, so that flashings are 295 lapped on top of the lower flashings. This will prevent moisture from leaking under the flashings and into the structure.

1. End Laps In case handling or transport consideration requires to use two (2) or more end tapped sheets to provide full length coverage for the roof run, each line of sheets shall be from bottom to top or from eave line to apex of roof framing. Minimum end lap of 150 mm shall be provided.
2. Anchorage/Fastening Pre-painted steel roofing sheets shall be fastened to the wood purlins with standard length G.I. straps, rivets or J-bolts. For steel frame up to 4.5 mm thick, self-drilling screw No. 12 by 35 mm long hexagonal head with neoprene washer shall be used. For steel support up to 5 mm thick or more, thread cutting screw No. 12 by 40 mm long hexagonal head with neoprene washer shall be used. Self-drilling screw No. 10 by 16 mm long hexagonal head with neoprene washer shall be used for side lap fastener. For valley fastened to lumber and for walling, self-drilling wood screw No. 12 by 25 mm long hexagonal head with neoprene washer shall be used. Self-drilling screws hexagonal head with neoprene washer shall be used for valleys fastened to steel supports. Drill size shall be 5 mm diameter.
3. Cutting of Sheets In cutting pre-painted steel roofing sheets and accessories, place the exposed color side down. Cutting shall be carried out on the ground and not over the top of other painted roofing product. 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.
4. 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 dry and if left in the open it shall be protected by covering the stack materials with loose tarpauline. Bundles should be stored above ground at a slight angle, to prevent water or condensation build up between adjacent sheets. Removing installation debris and metal fines due to drilling and cutting from the sheet surface and avoiding exposure of insulation to the weather shall be practice at all times.
5. 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 by the Engineer.

G. Basis of Payment

The area of pre-painted steel roofing and/or walling in square meters as provided in Section 1014.4, Method of Measurement shall be paid for at the unit bid or Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidental necessary to complete this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1014 (1)a1	Pre-painted Metal Sheets, below 0.427 mm, Corrugated, Short Span	Square Meter
1014 (1)a2	Pre-painted Metal Sheets, below 0.427 mm, Rib Type, Short Span	Square Meter
1014 (1)b1	Pre-painted Metal Sheets above 0.427 mm, Corrugated, Long Span	Square Meter
1014 (1)b2	Pre-painted Metal Sheets, above 0.427 mm, Rib Type, Long Span	Square Meter

XVII. CARPENTRY AND JOINERY WORKS

A. Description

The work under this Item shall consist of furnishing all required materials, fabricated woodwork, tools, equipment and labor and performing all operations necessary for the satisfactory completion of all carpentry and joinery works in accordance with the Plans and this Specification.

B. Material Requirements

a. Lumber

Lumber of the different species herein specified for the various parts of the structure shall be well-seasoned, sawn straight, sundried or kiln dried and free from defects such as loose unsound knots, pitch pockets, sapwood, cracks and other imperfections impairing its strength, durability and appearance. Jambs, transoms, mullions, headers, sills, frames, and wood base shall be air dried and well-seasoned for at least 2 months before use.

i. Grades of Lumber and Usage

1. Stress grade is seasoned, close-grained and high quality lumber of the specified specie free from defects and suitable for sustaining heavy loads. Stress grade lumber shall be used for wooden structural member subject to heavy loads, and for sub-floor framing embedded or in contact with concrete or masonry.
2. Select grade lumber of the specified specie is generally of high quality, of good appearance, without imperfections, and suitable for use without waste due to defects and suitable also for natural finish.
3. Select grade lumber shall be used for flooring, sidings, facia and base boards, trims, mouldings, millwork, railings, stairs, cabinet work, shelvings, doors, windows and frames of openings.
4. Common grade lumber has minimum tight medium knot not larger than 25 mm in diameter, with minimal imperfections, without sapwood, without decay, insect holes, and suitable for use with some waste due to minor defects and suitable also for paint finish.
5. Common grade lumber shall be used for light framework for wall partitions, ceiling joist and nailers.

ii. Lumber Species and Usage

Unless otherwise specified on the Plans, the following lumber species shall be used as indicated:

1. Yacal (stress grade) for structural member such as post, girders, girts, sleepers door and window frames set or in contact with concrete or masonry.
2. Guijo (select grade) for door and window frames set in wooden framework, for stairs, for roof framing supporting ceramic or cement tiles, for floor joists and other wooden structural parts.
3. Apitong (common grade) for roof framing supporting light roofing materials such as galvanized iron, aluminum, for wall framing, ceiling joists, hangers and nailers.
4. Tanguile (select grade) for door and windows, facia and base boards, trims, mouldings, millwork, railings, stairs, cabinet work, shelvings, flooring siding, ceiling joist, studs, roof framing and nailers.
5. Narra (select grade) for stair railings, flooring boards, wall panels base boards, trims, mouldings, cabinet work, millwork, doors and windows when indicated as such in the Plans.
6. Dao (selected grade) for stair railings, flooring boards, wall panels base boards, trims, mouldings, cabinet work, millwork, doors and windows when indicated as such on the Plans.

iii. Moisture Content

Except otherwise specified, lumber shall be sun-dried, or kiln-dried. At time of installation, the maximum moisture content, expressed as a percentage of the oven-dry wood, shall be as follows:

Rough Carpentry and Framing

- a. Framing lumber 50.80 mm and less in thickness: 19%
- b. Framing lumber over 50.80 mm thick: 25%

Interior millwork, finish and trim: 17%

iv. Substitution in Lumber Species

Any lumber equally good for the purpose intended may be substituted for the specified kind subject to the prior approval of the Engineer, provided the substitution shall be of an equal or better specie acceptable to the Engineer. In case of substitution with a better specie, no additional cost therefore shall be allowed to the Contractor

b. Plyboard

Plyboard shall be good grade and made of laminated wood strips of uniform width and thickness bounded together with water resistant resin glue. The laminated core shall be finished both faces with select grade Tanguile or red Lauan veneers not less than 2 mm thick similarly bonded to the core. The 232 plyboard of not less than 19 mm thick shall be free from defect such as split in veneer, buckling or warping.

c. Plywood

Plywood shall conform to the requirements of PNS ISO 12465:2017 Plywood – Specifications. Thickness of single layer laminae shall not be less than 2 mm. The

laminae shall be superimposed in layers with grains crossing at right angles in successive layers to produce stiffness. The face veneers shall be rotary cut from selected grade timber. The laminae and face veneers shall be bonded with water resistant resin glue, hot pressed and pressure treated.

Two (2) types of plywood based on bonding quality:

1. **Type I (Exterior/Marine Plywood)**
This is intended for ceiling exposed to moisture such as at toilets and eaves, partitions and doors (toilet and bath) and ceiling to be finished with acrytex.
2. **Type II (Interior/Ordinary Plywood)**
This is intended for interior ceiling, doors and partitions shall be of 6 mm thick tanguile plywood, grade "A", three (3) – ply with high water resistant.

Sample for testing shall comply with the applicable requirements of PNS ISO

12466-1:2016 Plywood – Bonding Quality – Part 1: Test Methods and PNS ISO
12466-2:2016 Plywood – Bonding Quality – Part 2: Requirements.

d. Lawanit

Lawanit, when required per plans, shall be 6 mm thick, tempered or oil-impregnated for moisture/water resistance. Texture of lawanit shall be subject to the approval of the Engineer.

e. Materials Other than Lumber

i. Plastic Sheet

When required for counter top, plastic sheet such as Formica shall not be less than 1.50 mm thick and shall have hard, durable and glossy surface resistant to stain, abrasion and heat. Color and design shall be as selected from the manufacturer's standard and approved by the Engineer.

ii. Glue

Glue shall be from water resistant resins which, upon hardening, shall not dissolve nor lose its bond or holding power even when soaked with water for extended period.

Glue in powder form be in sealed container and shall be without evidence of lumping or deterioration in quality.

iii. Fasteners

Nails, screw, bolts and straps shall be provided and used where suitable for fixing carpentry and joinery works. All fasteners shall be brand new and of adequate size to ensure rigidity of connections. 1. Nails of adequate size shall be steel wire, diamond-pointed, ribbed shank and bright finish. 2. Screws of adequate size shall be cadmium or brass plated steel with slotted head. 3. Lag screws of adequate size, for anchoring heavy timber framing in concrete or masonry, shall be galvanized steel. 4. Bolts and nuts shall be of steel having a yield point of not less than 245 MPa. Bolts shall have square heads and provided with standard flat steel washers and hexagonal nuts. Threads shall conform to American coarse thread series. The threaded portion shall be long enough such that the nut can be tightened against the

bolted members without any need for blocking. The bolt's threaded end shall be finished smooth for ease of engaging and turning of the nut. 5. Wrought iron straps or angles, when required in conjunction with bolts or lag screws to provide proper anchorage, shall be of the shape and size shown on the Plans.

iv. Fiber Cement Board

It shall comply with the applicable requirements of ASTM C1186, Standard Specification for Flat-Fiber Cement Sheets for exterior application and ASTM C1288, Standard Specification for Fiber-Cement Interior Substrate Sheets for interior application.

v. Gypsum Board

It shall comply with the applicable requirements of Item 1041, Gypsum Board.

vi. Pre-Painter Metal Panel

It shall comply with the applicable requirements of Item 1014, Pre-painted Metal Sheets.

vii. Aluminum Metal Cladding

Aluminum for metal cladding shall comply with the applicable requirements of Item 1039, Aluminum Cladding.

viii. Polyvinyl Chloride (PVC)

Polyvinyl Chloride (PVC) shall be made from 100% virgin PVC and Class A fire rating in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

ix. Moulding

Mouldings may be made of steel, wood, PVC, concrete and precast concrete or as indicated on the Plans. It shall match the surface where it shall be built.

Sizes, dimensions, colors, finishes, locations and design details shall be specified on the approved Plans and in accordance with the manufacturer's recommendation.

x. Modular Partition

Mouldings may be made of steel, wood, PVC, concrete and precast concrete or as indicated on the Plans. It shall match the surface where it shall be built.

Sizes, dimensions, colors, finishes, locations and design details shall be specified on the approved Plans and in accordance with the manufacturer's recommendation.

C. Construction Requirements

a. Quality Materials

All materials to be incorporated in the carpentry and joinery works shall be of the quality specified under Section 1003.2, Material Requirements. Before incorporation in work, all materials shall have been inspected/accepted by the Engineer or his authorized representative.

b. Storage and Protection of Materials

Lumber and other materials shall be protected from dampness during and after delivery at the site. Materials shall be delivered well in advance of actual need and in adequate quantity to preclude delay in the work. Lumber shall be piled in orderly stack at least 150 mm above ground and sheltered place where it will be of least obstruction to the work.

c. Shop Drawings

Lumber and other materials shall be protected from dampness during and after delivery at the site. Materials shall be delivered well in advance of actual need and in adequate quantity to preclude delay in the work. Lumber shall be piled in orderly stack at least 150 mm above ground and sheltered place where it will be of least obstruction to the work.

d. Rough Carpentry

Rough carpentry covers timber structural framing for roof, flooring, siding, partition and ceiling.

- i. Framing shall be stress grade or common grade lumber of the specie specified under Subsection 1003.2.1.2, Lumber Species and Usage.
- ii. Rough carpentry shall be done true to lines, levels and dimensions. It shall be squared, aligned, plumbed and well fitted at joints.
- iii. Trusses and other roof framing shall be assembled, fitted and set to exact location and slope indicated on the Plans.
- iv. Fasteners, connectors and anchors of appropriate type and number shall be provided and fitted where necessary.
- v. Structural members shall not be cut, bored or notched for the passage of conduits or pipes without prior approval of the Engineer. Members damaged by such cutting or boring shall be reinforced by means of specifically formed and approved steel plates or shapes, otherwise, damaged structural members shall be removed and replaced to the satisfaction of the Engineer.
- vi. Timber framing in contact with concrete masonry shall be treated with termite-proofing solution and after drying coated with bituminous paint.

e. Finished Carpentry

Finished carpentry covers work on flooring, siding and ceiling boards, stairs, cabinets, fabricated woodwork, millwork and trims.

- i. Framing lumber shall be select grade, free from defects and where exposed in finished work, shall be selected for color and grain.
- ii. Joints of framing shall be tenoned, mortised or doweled where suitable, closely fitted and secured with water resistant resins and glue. Exterior joints shall be mitered and interior angles coped.
- iii. Panels shall be fitted to allow for contraction or expansion and insure that the panels remain in place without warping, splitting and opening of joints.
- iv. Plyboard shall be as specified under Subsection 1003.2.2 unless otherwise indicated on the Plans.
- v. Plywood shall be specified under Subsection 1003.2.3.
- vi. Exposed edges of plywood or plywood for cabinets shall be provided with select grade hardwood strips, rabbeted as necessary, glued in place and

secured with finishing nails. To prevent splitting, hardwood for trims shall be drilled before fastening with nails or screws.

- vii. Fabricated woodwork shall be done preferably at the shop. It shall be done true to details and profiles indicated on the Plans. Where set against concrete or masonry, woodwork shall be installed when curing is completed.
- viii. Exposed wood surfaces shall be free from disfiguring defects such as raised grains, stains, uneven planing, sanding, tool marks and scratches. Exposed surfaces shall be machine or hand sanded to an even smooth surface, ready to finish.

f. Fiber Cement Board

Examine, clean, and repair as necessary any substrate conditions that would be detrimental to proper installation. Do not begin installation until unacceptable conditions have been corrected.

Prior to commencing installation, verify governing dimensions of building and condition of substrate. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

Installation requirements shall be in accordance with the manufacturer's instructions and drawing details approved by the Engineer.

- i. Use trim details indicated on drawings.
- ii. Touch up all field cut edges before installing.
- iii. Pre-drill nail holes if necessary to prevent breakage.

Over wood studs without sheathing. Install building paper over studs prior to installing siding.

Over wood and wood-composite sheathing. Fasten siding through sheathing into studs. For sheathing of 25 mm thickness or less, nail through sheathing into studs using correspondingly longer nails.

Over Masonry Walls. Install furring strips of adequate thickness to accept full length of nails and spaced at 406 mm on center.

Over steel studs. Minimum 20-gauge steel, 92 mm C-studs, size as indicated on drawings or as required by limiting span. Use 41 mm long, #8-18 x 9.50 mm HD self-tapping, corrosion-resistant ribbed bugle head screws. Attach panel at each stud insuring that at least three (3) screw threads penetrate the studs.

After installation, seal all joints. Seal around all penetrations.

For finish painting, follow manufacturer's recommendation timeline for painting primed and unprimed products. Paint all exposed cut edges.

g. Gypsum Board

Installation requirements shall conform to the applicable requirements of Item 1041, Gypsum Board.

h. Aluminum Metal Cladding

Installation requirements shall conform to the applicable requirements of Item 1039, Aluminum Cladding.

i. Prepainted Metal Panel

It shall comply with the applicable requirements of Item 1014, Prepainted Metal Sheets.

j. Moulding

Moulding color finishes shall match the wall or the surface where it will be installed. Cutting details of molding and its installation shall be in accordance with the manufacturer's instructions and detailed drawings approved by the Engineer.

k. Modular Partition

Installation requirements shall be in accordance with the manufacturer's instructions and detailed drawings approved by the Engineer.

D. Method Of Measurement

The quantity to be paid for will be measured as per individual item detailed in Section 1003.5, Basis of Payment for the complete Carpentry and Joinery as furnished on site and in accordance with these design standard, specifications and as accepted by the Engineer.

E. Basis Of Payment

The items measured and determined as provided in Subsection 1003.4, Method of Measurement shall be paid for at the unit bid price which payment constitute full compensation of materials, labor, equipment, tools and incidentals necessary to complete the work.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1003 (1)a1	Ceiling, 4.5 mm, Metal Frame, Fiber Cement Board	Square Meter
1003 (1)a2	Ceiling, 4.5 mm, Wood Frame, Fiber Cement Board	Square Meter
1003 (1)b1	Ceiling, 4.5 mm, Metal Frame, Marine Plywood	Square Meter
1003 (1)b2	Ceiling, 4.5 mm, Wood Frame, Marine Plywood	Square Meter
1003 (1)c1	Ceiling, 6 mm, Metal Frame, Marine Plywood	Square Meter
1003 (1)c2	Ceiling, 6mm, Wood Frame, Marine Plywood	Square Meter
1003 (1)d1	Ceiling, 6 mm, Metal Frame, Ordinary Plywood	Square Meter

Pay Item Number	Description	Unit of Measurement
1003 (1)d2	Ceiling, 6 mm, Wood Frame, Ordinary Plywood	Square Meter
1003 (1)e1	Ceiling, Metal Frame, Gypsum Board	Square Meter
1003 (1)e2	Ceiling, Metal Frame, Prepainted Metal Panel	Square Meter
1003 (1)e3	Ceiling, Metal Frame, Aluminum Metal Cladding	Square Meter
1003 (1)f	Ceiling, Wood Frame, Wood	Square Meter
1003 (2)a1	Wall, 4.5 mm, Metal Frame, Fiber Cement Board	Square Meter
1003 (2)a2	Wall, 4.5 mm, Wood Frame, Fiber Cement Board	Square Meter
1003 (2)b1	Wall, 6 mm, Metal Frame, Fiber Cement Board	Square Meter
1003 (2)b2	Wall, 10 mm, Metal Frame, Fiber Cement Board	Square Meter
1003 (2)b3	Wall, 12 mm, Metal Frame, Fiber Cement Board	Square Meter
1003 (2)be4	Wall, 6 mm, Wood Frame, Fiber Cement Board	Square Meter
1003 (2)c1	Wall, 4.5 mm, Metal Frame, Marine Plywood	Square Meter
1003 (2)c2	Wall, 4.5 mm, Wood Frame, Marine Plywood	Square Meter
1003 (2)d1	Wall, 6 mm, Metal Frame, Marine Plywood	Square Meter
1003 (2)d2	Wall, 6mm, Wood Frame, Marine Plywood	Square Meter
1003 (2)e1	Wall, 6 mm, Metal Frame, Ordinary Plywood	Square Meter
1003 (2)e2	Wall, 6 mm, Wood Frame, Ordinary Plywood	Square Meter
1003 (2)f	Wall, Aluminum Metal Cladding	Square Meter
1003 (2)g	Wall	Lump Sum
1003 (3)	Cabinets	Square Meter
1003 (4)	Cabinets	Each
1003 (5)	Roof Frame, Wood	Board Foot
1003 (6)	Floor Frame, Wood	Board Foot
1003 (7)	Flooring, Wood	Square Meter
1003 (8)	Flooring, Wood	Board Foot
1003 (9)	Wall Frame, Wood	Each
1003 (10)	Wall Frame, Wood	Meter

Pay Item Number	Description	Unit of Measurement
1003 (11)a1	Fascia Board, 19 mm, Fiber Cement Board	Meter
1003 (11)a2	Fascia Board, 25 mm, Lumber	Meter
1003 (12)	Fascia Board, Metal	Kilogram
1003 (13)	Phenolic Board	Each
1003 (14)	Phenolic Board	Square Meter
1003 (15)a	Moulding, Wood	Meter
1003 (15)b	Moulding, Concrete	Meter
1003 (15)c	Moulding, Precast	Meter
1003 (15)d	Moulding, PVC	Meter
1003 (15)e	Moulding, Steel	Meter
1003 (16)	Pressurized Laminated Wood Particles	Square Meter
1003 (17)	Carpentry and Joinery Works	Lump Sum
1003 (18)	Lawanit	Square Meter
1003 (19)	Wooden Post, Good Lumber	Board Foot
1003 (20)	Coco Lumber	Board Foot
1003 (21)	Moulding	Lump Sum
1003 (22)	Modular Partition	Square Meter
1003 (23)	Modular Partition	Lump Sum

XVIII. RAILINGS

A. Description

This Item shall consist of furnishing, fabricating and installing the railings for buildings and other similar structures of the material or combination of materials in accordance with this Specification and in conformity with the Plans.

Railings shall be classified as concrete, wooden, masonry, stone, metal, stainless steel and glass, in accordance with the predominating material contained in each.

Railing shall not be considered a part of the structural system of the building unless it is stated in the design.

B. Material Requirements

a. Concrete

It shall conform to the applicable requirements prescribed in Section 900.2, Material Requirements of Item 900, Structural Concrete.

b. Forms and Falseworks

It shall conform to the applicable requirements prescribed in Subsection 903.2 Material Requirements of Item 903, Formworks and Falseworks.

c. Lumber, Plywood and Other Related Materials

It shall conform to the applicable requirements prescribed in Section 1003.2, Material Requirements of Item 1003, Carpentry and Joinery Works.

d. Hardware

This shall conform to the applicable requirements of prescribed in Section 1004.2, Material Requirements of Item 1004, Hardware.

e. Masonry

These shall conform to the requirements of Section 1046.2, Material Requirements of Item 1046, Masonry Works.

f. Mortar

Mortar shall consist of sand, cement and water conforming to the requirements of Item 900, Structural Concrete, mixed in the proportion of one (1) part cement to three (3) parts sand by volume, and sufficient water to obtain the required consistency.

g. Reinforcing Steel

It shall conform to the applicable requirements of Subsection 902.2.2, Material Requirements of Item 902, Reinforcing Steel.

h. Stone

Stones shall be clean, hard, and durable and shall be subjected for the Engineer's approval. Adobe stones shall not be used unless otherwise specified.

i. Metal

Steel base metal to be welded shall be open-hearth or electric furnace steel conforming to AASHTO M 183, Standard Specification for Structural Steel, unless otherwise shown on the Plans.

j. Stainless Steel (Non-Ferrous Metal)

It shall conform to the requirements of ASTM A276M, Standard Specification for Stainless Steel Bars and Shapes or as called for in the Plan

k. Glass and Glazing

It shall conform to the applicable requirements prescribed in Section 1012.2 Material Requirements of Item 1012, Glass and Glazing.

Glass shall be laminated, heat strengthened, and tempered unless otherwise indicated in the Plans. If laminated glass were called for in the Plans it shall conform to ASTM C1048, Standard Specification for Heat-Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass and ASTM C1172, Standard Specification for Laminated Architectural Flat Glass. The minimum thickness of glass shall be 6 mm unless otherwise indicated in the Plans. If glass is intended for exterior railing in-fill panels, it shall comply with the following:

- i. Test shall be in accordance with ASTM E2353, Standard Test Methods for Performance of Glass in Permanent Glass Railing Systems, Guards and, Balustrades. The said standard evaluates static strength, impact resistance, and post-break retention.
- ii. Railing systems shall be in accordance to ASME E 2358, Standard Specification for the Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades. These systems include glazing in-fill, as well as structural glass railing types. The four (4) levels of performance are shown.

Table 1051.1 Levels of Performance

Performance Level	ASTM E935 (Structural ^A) (Minimum)	ANSI Z97.1 (Safety Impact ^B) (Minimum)
1	Concentrated load: 890 N Uniform Load: 290 N/m Infill Horizontal Load: 220N	Pass 230 J
2	Concentrated load: 890 N Uniform Load: 290 N/m Infill Horizontal Load: 220 N	Pass 542 J
3	Concentrated load: 1330 N Uniform Load: 730 N/m Infill Horizontal Load: 220N	Pass 542 J
4	Concentrated load: 1620 N Uniform Load: 880 N/m Infill Horizontal Load:220 N	Pass 542 J

Note: ^A Tests performed as outlined in ASTM E935, Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

^BTests performed as described in ANSI Z97.1 2015, For safety glazing materials used in buildings - safety performance specifications and method test.

i. Aluminum

It shall conform to the requirements of ASTM B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

m. Painting, Varnishing and Other Related Works

These shall conform to the applicable requirements prescribed in Section 1032.2, Material Requirements of Item 1032, Painting, Varnishing and Other Related Works.

C. Construction Requirements

a. General

Railings shall be constructed in accordance with the Plans and shall not reflect any unevenness in the structure/building. All railing posts shall be set plumb unless otherwise indicated on the Plans.

b. Concrete Railing

Concrete railing shall be constructed in accordance with the requirements of Subsection 900.3 Construction Requirements of Item 900, Structural Concrete.

i. Concrete Railing Cast in Place

Forms shall be secured to be smooth and tight fitting which can be rigidly held in line and grade and removed without damage to the casted concrete structure.

Forms shall either be of single width boards or shall be lined with suitable material to have a smooth surface which shall meet the approval of the Engineer or as shown in the Plans.

All moldings, panel work and bevel strips shall be constructed according to the detailed Plans with mitered joints. All corners in the finished work shall be true, sharp and clean cut, and shall be free from cracks, spalls, honeycombs and other defects.

ii. Precast Railings

Moist tamped mortar precast members shall be removed from the molds as soon as it is practicable and shall be kept damp for a period of at least ten (10) days. Any member that shows cracking of soft corners of surfaces shall be rejected.

iii. Wooden Railing

The construction requirements shall be in conformance, whenever applicable, with Subsection 1003.3 Construction Requirements of Item 1003, Carpentry and Joinery Works.

iv. Masonry Railing

The construction requirements shall be in conformance, whenever applicable, with Subsection 1046.3 Construction Requirements of Item 1046, Masonry Works

v. Stone Railing

The maximum projection of stones beyond the pitch lines and shall not be more than 50 mm.

vi. Metal Railing

The metal railing shall be fabricated in accordance with the dimensions shown on the approved Plans. In case of welded railings, all exposed joints shall be finished by grinding or filing after welding to give a neat appearance. Welding may be substituted for rivets or bolts with the approval of the Engineer

vii. Stainless Steel Railing

The metal railing shall be fabricated in accordance with the dimensions shown on the Plans. During installation, stainless steel railing shall be free from rust and surface blemish. It shall be rust free until ten (10) years after completion.

viii. Glass Railing

The construction requirements shall be in conformance, whenever applicable, with Section 1012.3 Construction Requirements of Item 1012, Glass and Glazing.

D. Method Of Measurement

The quantity to be paid for shall be the number of meters of specified railing materials and sizes or by lump sum for actually completed and accepted measured from center to center of end posts as shown on the Plans or as directed by the Engineer.

E. Basis Of Payment

The accepted quality, measured as prescribed in Section 1051.4, Method of Measurement shall be paid for at the Contract Unit Price for Railing, which price and payment shall be full

compensation for furnishing and placing all materials including all labor, equipment, tools and incidentals necessary to complete this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1051 (1)a	Railing	Lump Sum
1051 (1)b	Railing	Meter
1051 (2)a	Concrete Railing, Standard	Meter
1051 (2)b	Concrete Railing, Baluster	Meter
1051 (2)c	Concrete Railing, Parapet	Meter
1051 (3)	Wooden Railing	Meter
1051 (4)	Stone and Brick Railing	Meter
1051 (5)	Metal Railing	Meter
1051 (6)	Stainless Steel Railing	Meter
1051 (7)	Glass Railing	Meter

XIX. PAINTING, VARNISHING AND OTHER RELATED WORK

A. Description

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

B. Material Requirements

a. Paint Materials

Paint material shall conform to the requirements of the following Specifications:

Table 1032.1 Paint Material Specification Requirements

Material	PNS Code	Description	Application
Flat Latex Paint	PNS 139	Specification for Flat Latex Paint (white and light tints for exterior and interior use)	Properly prepared plaster, masonry and primed wood and other architectural surfaces
Semi-gloss Latex Paint	PNS 463	Specification for Semi-Gloss Latex Paint (white and light tints for exterior and interior use)	Properly prepared plaster, masonry and primed wood and other architectural surfaces
Semi-gloss Enamel Paint	PNS 225	Specification for Alkyd-based Semi-Gloss Enamel Paint (white and light tints for exterior and interior use)	Properly prepared plaster, masonry and primed wood and other architectural surfaces
Enamel Paint	PNS 226	Specification for Alkyd-based Gloss Enamel Paint (white and coloured for exterior and interior use)	Wood, metal and other architectural surfaces
Alkyd-based Metal Primer	PNS 366	Specification for Alkyd-based Metal Primer	Ferrous metal
Epoxy Metal Primer	PNS 2113	Specification of Epoxy Metal Primer	Ferrous metal
Flatwall Enamel Paint	PNS 227	Specification for Alkyd-based Flat Enamel Paint (white and light tints for exterior and interior use)	Wood
Gloss Latex Paint	PNS 462	Specification for Gloss Latex Paint (white and light tints for exterior and interior use)	Masonry
Water Based	PNS 617	Specification for Water Based Glass	Concrete, metal, wood and other paintable
Epoxy Enamel	PNS 2118	Specification for Epoxy Enamel, white and coloured	Concrete, wood, metal and other architectural surfaces
Roof paint (water-based, flat)	PNS 464	Specification for Roof paint (water-based, flat)	Paintable roofing materials
Roof paint (Portland Cement)	PNS 465	Specification for Roof paint (Portland Cement)	Paintable roofing materials

b. Tinting Colors

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

c. Acry-Colors

It shall be high strength tinting colors for water-based coatings that are specially formulated from the finest blend of pigments combined with pure acrylic latex vehicle that is easy to disperse, fast drying, odorless, and gives maximum color retention.

d. 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.

e. Silicon Water Repellant

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

f. Patching Compound

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

g. 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.

h. 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. Clear gloss lacquer shall be in accordance with the requirements of PNS 368, Specification for Clear Gloss Lacquer.

i. Shellac

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

j. 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. It shall be in accordance with the requirements of PNS 367, Specification for Lacquer Sanding Sealer.

k. Oil Wood Stain

Oil-based stain shall be a penetrating stain for interior doors, windows, trim and furniture. It rejuvenates and transforms interior timber. Oil-based stain penetrates deeply and adds color without raising the grain. Oil-based stain is best used to rejuvenate old or used timber.

l. Glazing Putty

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

m. 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.

n. Schedule

Exterior

- i. Plain cement plastered finish to be painted - Three (3) coats acrylic base masonry paint
- ii. Concrete exposed aggregate and/or tool finish - One (1) coat water repellent
- iii. Ferrous metal - One (1) coat primer and two (2) coats enamel paint
- iv. Galvanized metal - One (1) coat zinc chromate primer and two (2) coats Portland cement paint
- v. Wood paint finish - Three (3) coats oil based paint
- vi. Wood varnished finish - Varnish water repellent

Interior

- i. Plain cement plastered finish to be painted - Two (2) coats acrylic base masonry paint
- ii. Concrete exposed aggregate and/ or tool finish - Clean surface
- iii. Ferrous metal - One (1) coat primer and two (2) coats enamel paint
- iv. Woodwork sea-mist - Three (3) coats of three (3) parts thinner and one (1) part lacquer
- v. Woodwork varnish - - First coat of one (1) part sanding sealer to one (1) part solvent Second coat of two-third (2/3) sanding sealer to one-third (1/3) solvent
- vi. Woodwork painted finish - Three (3) coats oil base paint
- vii. Ceiling boards textured finish - One (1) coat oil based paint, allow to dry then patch surfaces unevenness and apply textured paint coat

o. Containers and Markings

It shall be in accordance with the requirements of PNS 140, General Requirements for Packaging, Packing and Marking of Paints and Other Protective Coatings.

All paints, varnishes, and other related products shall be shipped in strong, substantial containers marked in prints distinctive color of the label or in letters clearly visible to the naked eye with the following information:

- i. Type of Paint
- ii. Brand or Trademark
- iii. Name and address of manufacturer
- iv. Net Volume and/or mass in metric units
- v. Directions for use

- vi. Safety precautions
- vii. Batch or lot number any package or container not so marked will not be accepted for use under this Specification.

C. Construction Requirements

Prior to commencement of the painting, varnishing and related work, the surfaces to be applied shall be examined in order not to jeopardize the quality and appearances of the painting, varnishing and related works.

a. Surface Preparation

All surfaces shall be in proper condition to receive the finish. Woodworks shall be hand-sanded smooth and dusted clean. All knot-holes 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 the 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 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 following shall be undertaken prior to painting, varnishing and other related works:

- i. Voids, cracks, nick, and other wood imperfections will be repaired with proper patching material and finished flushed with surrounding surfaces.
- ii. Marred or damaged shop coats on metal shall be spot primed with appropriate metal primer.
- iii. Painting and varnishing works shall not be commenced when it is too hot or cold.
- iv. Allow appropriate ventilation during application and drying period.
- v. All hardware will be fitted and removed or protected prior to painting and varnishing works.

b. Application

Paints when applied by brush shall become non-fluid, thick enough to lay down as adequate film of wet paint. Brush marks shall be flawed out after application of paint.

Paints made for application by roller must be similar to brushing paint. It must be non-sticky 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

c. 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 one (1) pint of suitable thinner per gallon of the paint.

d. Storage

All materials 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 times. Necessary precaution to avoid fire must be observed by removing oily rags, waste, etc. at the end of daily work.

e. 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. Paint drips, oil, or stains on adjacent surfaces shall be removed and the entire job left clean and acceptable to the Engineer.

f. Workmanship in General

- i. 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.
- ii. All coats shall be thoroughly dry before the succeeding coat is applied.
- iii. 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. 4. 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. 5. 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.

g. Procedure for Sea-Mist Finish

- i. Depress wood grain by steel brush and sand surface lightly.
- ii. Apply sanding sealer.
- iii. Apply two (2) coats of industrial lacquer paint.
- iv. Spray last coat of industrial lacquer paint mixed with sanding sealer.
- v. Apply wood paste filler thinned with turpentine or paint thinner into the wood surface.
- vi. Wipe off wood paste filler immediately.
- vii. Spray flat or gloss lacquer whichever is specified.

h. Procedure for Varnish Finish

- i. Sand surface thoroughly.

- ii. Apply putty on all cracks and other wood imperfections with wood paste filler.
- iii. Apply oil stain.
- iv. Apply lacquer sanding sealer. 375
- v. Sand surface along the grain.
- vi. Spray three (3) coats of clear dead flat lacquer.
- vii. Polish surface coated using cloth pad.
- viii. Spray gloss lacquer or flat lacquer whichever is desired or specified.

i. Procedure for Ducco Finish

- i. Sand surface thoroughly
- ii. Apply primer surface white or gray by brush or spray.
- iii. Apply lacquer spot putty in thin coat. Allow each coat to become thoroughly dry before applying next coat.
- iv. Apply primer surfaces and then allow to dry in 2 h before applying the next coat.
- v. Apply a coat of flat tone semi-gloss enamel as per color scheme submitted and approved by the Engineer

D. 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.

E. Basis Of Payment

The accepted work shall be paid at the unit bid price, which price and payment constitute full compensation for furnishing and proper application of all materials, labor, equipment, tools and other incidental necessary to complete this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1032 (1)a	Painting Works, Masonry/Concrete	Square Meter
1032 (1)b	Painting Works, Wood	Square Meter
1032 (1)c	Painting Works, Steel	Square Meter
1032 (2)	Varnishing	Square Meter
1032 (3)	Sea-mist Finish	Square Meter
1032 (4)	Ducco Finish	Square Meter
1032 (5)	Texture Finish	Square Meter

XX. PLUMBING

A. 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 and fire

protection system including installation in accordance with the latest edition of the Revised National Plumbing Code, Uniform Plumbing Code of the Philippines, The Fire Code of the Philippines, The National Building Code, and this Specification.

B. 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.

a. Cast Iron Soil Pipes and Fittings

- I. Pipes and fitting materials shall comply with the Specification requirements, whenever applicable, defined in ASTM A74, Standard Specification for Cast Iron Soil Pipe and Fittings. The material description and standards of manufacture are herein described.
 1. Cast Iron – the casting shall be made of gray iron which shall be sound, free from cracks, sand holes 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.
 2. 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 resultant shall be gray iron of good quality.
 3. Manufacture – the pipes shall be made with hub and spigot ends or hub ends only. All hubs for pipes and fittings shall be provided with held lead grooves and all spigot ends shall be made with beads or plain if machine cast centrifugally. Plugs shall be wrought or cast, machined to the dimensions required and shall be free from defects.
 4. 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.
- ii. Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe. 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 100 mm diameter. Cleanouts installed under concrete or asphalt paving shall be made accessible by yard boxes or by extending flush with paving with approved materials and shall be adequately protected.
- iii. Caulking lead shall be of molten type peg lead conforming to specification requirements defined in ASTM B29, Standard Specification for Refined Lead.
- iv. Oakum shall be twisted or braided hemp or abaca fibers slightly impregnated with oil.

b. Water Supply Pipes and Fittings

- I. Pipes shall be galvanized iron pipe schedule 40 conforming to specification requirements defined in ASTM A53M, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless with threaded