097.12 DPWH
09-08-2017

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

06 SEP 2017

DEPARTMENT ORDER)
)
No. 110)
Series of 2017 09.07.17)

SUBJECT : DPWH Standard Specification for Item 1016 - Waterproofing

In line with the mandate of the Department in providing effective standard specifications in the implementation of various infrastructure projects and in view of the need of setting a standard specification for waterproofing, the attached **DPWH Standard Specification for Item 1016 - Waterproofing** is hereby prescribed, for the guidance and compliance of all concerned.

This specification shall form part of the on-going revision of the DPWH Standard Specifications for Public Works Structures - Buildings, Ports and Harbors, Flood Control and Drainage Structure and Water Supply Systems, Volume III, 1995 Edition.

This Order shall take effect immediately.

MARK A. VILLAR
Secretary

Department of Public Works and Highways
Office of the Secretary
WIN7U01511

14.1.2 FET/RPF

AMENDMENT TO THE DPWH STANDARD SPECIFICATION FOR ITEM 1016 – WATERPROOFING

1016.1 Description

This Item shall consist of furnishing all waterproofing materials, labor, tools, equipment and other facilities in undertaking the proper installation works required as shown on the Plans and in accordance with this Specification.

1016.2 Material Requirements

1016.2.1 Cement-base Waterproofing

1016.2.1.1 Cement-base Waterproofing Powder Mix

1. Cement-base waterproofing powder mix shall be cement-base, aggregate type, heavy duty, water-proof coating for reinforced concrete surface and masonry exposed to water. The aggregates are graded and sized so as to mesh perfectly and are selected for purity, hardness, strength and are non-metallic. When mixed with other ingredients, the mix shall be a free flowing, water-proof coatings that possesses strength durability and density.

2. Additive binders shall be of special formulation of acrylic polymers and modifiers in liquid form used as additive with cement-base powder mix that improves adhesion and mechanical properties.

3. Water shall be clean, clear and potable.

4. One (1) brand or type of waterproofing material shall be used on the project.

5. Waterproofing materials shall be stored in a weather-tight enclosure to avoid moisture damage and absorption.

1016.2.1.2 Hydrolithic Waterproofing Mix

1. Hydrolithic waterproofing mix shall be of heavy cement-based coating compatible to reinforced concrete wall. It must prevent built-up of water vapor which causes blistering, flaking and peeling of paint films.

2. Material must thoroughly fill and seal pores and voids that it can be used against water pressure on the interior surface of walls below grade.

1016.2.2 Built-Up and Preformed Bituminous Membrane Waterproofing

Primer shall be of asphalt cold applied, free from water and other foreign matters, and shall conform to the specifications requirement defined in ASTM D 41, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

Built-up membrane shall be made of smoothly woven fibers that are impervious to acid, heat, dampness, and totting. It should permit complete penetration of asphalt compound or bituminous coating in the woven glass fiber.

Built-up membrane shall conform to the requirements of ASTM C 981M, Standard Guide for Bituminous Membrane Waterproofing Systems for Building decks.

Preformed membrane shall be self-sealing flexible cold applied bituminous sheets bonded to 0.15 mm thick polyethylene film.

1016.2.2.4 Mopping Materials

It shall conform to the requirements of ASTM D 449M, Standard Specification for Asphalt Used in Dampproofing and Waterproofing:

1. Type I - A soft, adhesive, "self-healing" asphalt that flows easily under the mop and is suitable for use below grade under uniformly moderate temperature conditions both during the process of installation and during service.

2. Type II - A somewhat less susceptible asphalt than Type I, with good adhesive and "self-healing" properties, suitable for use above grade where it will not be exposed to temperatures exceeding 50°C.

3. Type III - An asphalt less susceptible to temperature than Type II, with good adhesive properties, and suitable for use above grade on vertical surfaces exposed to direct sunlight or temperatures above 50°C

1016.2.3 Liquid Waterproofing

Liquid waterproofing alternate material shall be of elastomeric or other substances applied in liquid form and cured to an impervious membrane.

For long-term UV and weather resistance, a high performance synthetic rubber-based membrane type of liquid waterproofing is highly suggested to be used. For tiled finishes that is capable of accommodating expected structural movements, a waterborne flexible SBR waterproof membrane can be used. For waterproofing shower recesses, bathrooms, laundries, decks, balconies and rooftops, an elastomeric, one part, fiber reinforced, water based polyurethane membrane can be used

1016.3 Construction Requirements

Roof decks, balconies, toilet and bathrooms, gutters, parapet walls and other areas indicated on the plans to be waterproofed shall first be rendered with cement-based waterproofing before any type of waterproofing is applied.

1016.3.1 Surface Preparation

Concrete surface to be applied with waterproofing shall be structurally sound, clean and free of dirt, loose mortar particles, paints, films, oil, protective coats, efflorescence laitance, etc.

All defects shall be properly corrected and carefully formed to provide a smooth surface that is free of marks and properly cured prior to application works.

Inside corners where vertical and horizontal structure meet shall be provided with cants measuring 75 mm by 75 mm or rounded at corners a minimum of 75 mm radius.

1. Concrete slabs shall be properly graded to drain rainwater. Provide a minimum pitch of 1:100 to satisfactorily drain rainwater freely into the drainage lines, gutters and downspouts.

2. Drainage connections and weepholes shall be set to permit the free flow of water.

3. Any expansion and contraction joints shall be cleaned, primed, fitted with a backing rod and caulked with sealant.

4. Provide reglets of about 40 mm deep by 40 mm wide and 250 mm above floor finish along walls or parapets for the termination of the membrane.

5. Prepared surfaces shall be cured and kept wet by sprinkling with water at regular intervals for a period of at least three (3) days and allow surface to actually set within seven (7) days.

6. Ensure that the prepared surface has completely set and all defects repaired.

7. When there is reasonable doubt as to the presence of moisture in the surface to be applied with membrane, expose the same direct to sunlight for another two (2) days or heat all suspected area using blow torch.

1016.3.2 Preformed or Built-up Membrane

1016.3.2.1 Application Procedure

1. Prior to application of membrane concrete surfaces should be sound and cured without the use of curing compound. Apply a coat of concrete neutralizer to remove oil dirt and other contaminants.

2. Apply asphalt primer at the rate of 4 liters per 9 square meter evenly by spraying or by paint brush.

3. Application shall be done in one direction strip and by overlapping each other to assure uniform thickness.

4. Allow primer to dry until it is ready to receive the next coat or layer as specified in the manufacturing instructional manual.

5. As soon as primer coating is workable, lay a single layer of preformed or built-up membrane smoothly free from irregularities and folds.

6. Lay preformed or built-up membrane conforming to the size and shape of the surface area to be covered.

7. Carefully lay side and end laps in order to assure an even thickness throughout the whole surface area to be covered.

8. When the whole surface area is completely covered, apply a single coat of asphalt primer at the rate of 11 to 15 liters per 9 square meters.

9. Meshes of treated woven glass fibers shall not be completely closed or sealed by the primer coat, but shall sufficiently open to allow successive moppings of the ply material to seep through.

10. Cover ply not more than the minimum amount of surfacing necessary to prevent sticking on ply.

11. After application, the surface shall be uniformly smooth, free from irregularities folds and knots.

12. Repeat the procedure until five (5) plies has been satisfactorily installed or as the layers required are satisfied as specified in the Plans.

13. Where weather disturbance interrupt the work and exposing the membrane to moisture, remove the layer exposed to moisture and repeat procedure until completion of the process.

1016.3.2.2 Protective Coatings

1. Where laying of the built-up or preformed membrane conforms to the number of plies required as shown on the Plans, lay a mixture or sand mastic in the proportion of one (1) part asphalt or bituminous material and four (4) parts coarse screened sand by volume using a steel trowel at an average of three (3) mm thick over the surface of the membrane.

2. Then at the rate of four (4) liters per nine (9) square meter, apply aluminum heat reflecting finish thoroughly over the dried sand mastic coating.

1016.3.2.3 Metal Cap Flashing

1. Provide cap flashing, gauge 24 plain G.I. as shown on the Plans.

2. Where cap flashing is connected to pre-formed lock in through-wall, form upper edge of cap flashing to engage in pre-formed lock. Mallet lock down tight to provide a spring action against base flashing.

3. At the rate of four (4) liters per 9 square meter, apply aluminum heat reflecting finish thoroughly over the dried sand mastic coating.

4. Where cap flashing is terminated in raked joints or in prepared masonry or stone reglet, flashing shall be fastened with wedge every 350 mm and fill reglet on vertical surfaces, continuous with molten lead.

1016.3.3 Membrane Waterproofing Cement Topping

1. Provide concrete cement topping of at least 50 mm thick on the membrane after five days where protective coatings has been applied.

2. Concrete cement topping should be class "A" with nine (9) mm pea gravel and preferably provided with 2-way 6 mm dia. temperature steel bars.

1016.3.4 Liquid Waterproofing as Membrane

Before any coat of liquid waterproofing is applied, concrete cement surface shall conform to the requirement defined in sub-section 1016.3.1, Surface Preparation.

1016.3.4.1 Application

1. Prior to application of membrane concrete, surfaces should be sound and cured without the use of curing compound. Apply a coat of concrete neutralizer to removed oil, dirt and other contaminants.

2. Apply a primer coat of elastomeric coating standard of the manufacturer at the rate of 1.33 liters per 9.28 square meter over the surface area to be applied.

3. After the primer coat has dried penetrating and sealing the concrete surface areas, apply twenty-five (25) dry mills of coating at the rate of 4 liters per 100 square meter for three (3) coatings on the same concrete surface areas coated with liquid waterproofing.

4. The concrete surface areas coated shall be allowed to dry in twenty-four (24) hours if relative humidity is above 4.44 Centigrade.

5. Liquid waterproofing membrane may be applied by paint brush, airless spray, notched trowel, squeegee or roller. Preferably, each coat shall have twenty (20) to twenty-five (25) mill maximum thickness.

1016.3.4.2 Precaution

1. Liquid waterproofing membrane should not be applied unless the ambient temperature is 4.44 Centigrade or higher and should not proceed during inclement weather condition.

2. Extra care shall be observed by persons doing the application works especially those that have skin sensitiveness must wear gloves while applying the liquid waterproofing. The liquid water-proofing membrane compound is highly combustible.

1016.3.5 Protection of Membrane Waterproofing Surfaces in General

1. Concrete topping in situation where it is desirable to have a bond between membrane waterproofing and topped, slab it is recommended that the concrete topping be placed as the membrane dries, usually 48 hours after final coat is applied.

2. If a bond is not required, the membrane should be protected with asphalt asbestos board or asphalt felt paper until such time as topping or concrete covering is applied. Prior to topping or placing of concrete covering, the membrane shall be inspected and initiate repair work where necessary.

3. Exposed membrane surfaces at concrete gutters and areas not frequently disturbed may be allowed.

4. Membrane waterproofing at basement shall be covered and protected by installing tightly butted asphalt impregnated protection boards with a minimum thickness of 6 mm and preferably 12 mm on horizontal areas.

All projections and pipes must be protected with asbestos cloth approximately 6 mm thick. Install the bituminous paving with extra care to avoid damage, lift or curl the underlying protection boards.

1016.4 Method of Measurement

This Item shall be measured in square meters for areas actually rendered with membrane waterproofing and number of packages for integrally waterproofed areas accepted to the satisfaction of the Engineer.

1016.5 Basis of Payment

The accepted quantities, measured as prescribed in Section 1016.4 shall be paid for at the contract unit price for integral and membrane waterproofing work which price and payment shall be full compensation for furnishing and applying integral and membrane waterproofing materials including the use of equipment and tools, labor and incidentals necessary to complete the work.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
1016 (1)a	Waterproofing, Cement-base	Square meter
1016 (1)b	Waterproofing, Liquid	Square meter
1016 (2)	Built-up and Preformed Membrane	Square meter

References:

1. ASTM D 41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
2. ASTM D 449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
3. ASTM C 981M - Design of Built-Up Bituminous Membrane Waterproofing Systems for Building Decks.
4. http://glueideas.com/content-collection/Radfords-cyclopedia-of-construction-Vol-5-Cement-Concrete-Machinery/Methods-of-Waterproofing_P5.html
5. https://theconstructor.org/concrete/types-waterproofing-methods-construction/10856/
6. Bituthene 6000, product brochure