DEP	Republic of the Philippines PARTMENT OF PUBLIC WORKS AND HIGHWAYS OFFICE OF THE SECRETARY Bonifacio Drive, Port Area Manila	0917.13 DPWH 08.05.2024 BAGONG PILIPINAS
AUG 0 2 2024 DEPARTMENT ORDER NO Series of 2024 dy ets 2024	SUBJECT: DPWH Standard SUBJECT: DPWH Standard Item 310 (15) Concrete Surface Density Polyethyl Bag Waste, Hot-La	Specification for) – Bituminous Course with Low- ene (LDPE) Plastic aid

In line with the continuing efforts to support sustainable engineering and upgrade construction technology through adoption of successful research studies, this Department has approved the use of Low-Density Polyethylene (LDPE) Plastic Bag Waste in Hot Mix Asphalt (HMA), subject to the specifications hereto attached.

The Standard Specification shall form part of the DPWH Standard Specifications for Highways, Bridges, and Airports, Volume II and is now included in the Project and Contract Management Application (PCMA).

This Order shall take effect immediately.

MANUEL BONOA Secretary



Encl.: DPWH Standard Specification for Item 310 (15) – Bituminous Concrete Surface Course with Low-Density Polyethylene (LDPE) Plastic Bag Waste, Hot-Laid

14.1.2 MLL/JDV/RPF

⊕ Website: https://www.dpwh.gov.ph
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DPWH Standard Specification for ITEM 310 (15) – Bituminous Concrete Surface Course with Low-Density Polyethylene (LDPE) Plastic Bag Waste, Hot-Laid

310 (15).1 Description

This Item shall consist of Bituminous Concrete Surface Course with Low-Density Polyethylene (LDPE) plastic bag waste, constructed on a prepared base or surface course, in accordance with this Specification and in conformity with the lines, grades and typical cross-sections shown on the Plans.

LDPE - is a thermoplastic polymer such as plastic bag waste shredded and used as an additive to reduce the susceptibility to permanent deformation of bituminous mixes.

310 (15).2 Material Requirements

310 (15).2.1 Composition and Quality of Bituminous Mixture (Job-Mix Formula)

The Job-Mix Formula shall conform to the requirements of Subsection 307.2.1, Composition and Quality of Bituminous Mixture of Item 307, Bituminous Plant-Mix Surface Course – General.

The bituminous mixture shall be composed of bituminous material, aggregates, mineral filler, hydrated lime, and LDPE (plastic bag waste) and shall conform to the requirements of Table 310 (15).1.

Property	Requirement (Heavy Traffic)	
Binder Content, %		
By wt. of mix	-	
By wt. of agg.	5.00 - 8.00	
Bulk Specific Gravity(BSG)	-	
Marshall Stability, N (lbs.), Min.	8,006 (1,800)	
Air Voids, %	3.00 - 5.00	
Flow, 0.25 mm, Min.	8	
Voids in Mineral Aggregates (VMA), %	14.00	
Voids Filled with Asphalt (VFA), %	65.00 – 75.00	

Table 310 (15).1 Marshall Mix Design for Surface Course

The LDPE plastic bag waste content shall not exceed 7.39% by weight of binder. The exact percentage to be used shall be fixed by the Engineer in accordance with job-mix formula and other quality control requirements.

The mixture shall have a minimum compressive strength of 1.4 MPa when tested by AASHTO T167, Standard Method of Test for Compressive Strength of Hot Mix Asphalt and an Index of Retained Strength of not less than 70 when tested by AASHTO T 165, Standard Method of Test for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures.

310 (15).2.2 Bituminous Material

It shall be an asphalt cement with penetration grade 60/70 and shall conform to the requirements of Item 702, Bituminous Materials.

310 (15).2.3 Aggregates

It shall be crushed/manufactured aggregates using the design aggregate gradation based on Grading D of Item 703, Aggregates.

310 (15).2.4 Mineral Filler

It shall conform to the requirements of Item 703A, Mineral Filler.

310 (15).2.5 Hydrated Lime

It shall conform to the applicable requirements of Item 701, Hydrated Lime.

310 (15).2.6 Low-Density Polyethylene (LDPE) Polymer

It shall consist of clean, dry, flexible, very lightweight, and relatively translucent plastic bag waste shredded into sizes varying from 6.35 mm to 12.7 mm.

310 (15).3 Construction Requirements

The construction of Hot Mix Asphalt (HMA) with LDPE plastic bag waste shall be in accordance with the applicable requirements of Section 307.3 Construction Requirements of Item 307, Bituminous Plant-Mix Surface Course – General, except for the addition of plastic bag wastes.

310 (15).3.1 Mixing

The injection of the material into the mixer shall be in the following order:

- a. Aggregates heated to about 165°C 175°C;
- b. Mineral Filler (if specified);
- LDPE (plastic bag wastes) added directly to the heated aggregates before adding the binder. In the mixing chamber, the shredded plastic shall be mixed within fifteen (15) seconds to ensure a uniform coating over the aggregate; and,
- d. Asphalt heated to about 145°C 165°C.

The mixing process is through dry mixing for 15 seconds, followed by a prolonged mixing process of approximately 35 seconds to achieve a homogenous mixture when the plastic-coated aggregates are combined with the bitumen (wet mixing).

310 (15).4 Method of Measurement

Bituminous Concrete Surface Course with Low-Density Polyethylene (LDPE) plastic bag waste shall be measured in square meters (m²). The quantity to be paid for under this Item shall be the number of square meters of the mixture placed and compacted in the accepted based on the thickness and density of the cores taken in accordance with Subsection 307.3.10, Acceptance, Sampling and Testing.

310 (15).5 Basis of Payment

The accepted quantities, measured as prescribed in Section 310 (15).4, Method of Measurement shall be paid for at the Contract Unit Price for Bituminous Concrete Surface Course with Low-Density Polyethylene (LDPE) plastic bag waste, which price and payment shall be full compensation for furnishing and placing all materials, including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this Item.

Payment shall be made under:

Payment Item Number	Description	Unit of Measurement
310 (15)	Bituminous Concrete Surface Course with Low- Density Polyethylene (LDPE) Plastic Bag Waste	Square Meter

References:

- 1. Final Evaluation Report of the Study on the Use of low-Density Polyethylene (LDPE) Polymer (Plastic Bag Waste) as Additive or Modifier in Hot Mix Asphalt
- 2. DPWH Standard Specifications for Highways, Bridges and Airport, Volume II, 2012 Edition a. Item 307 – Bituminous Plant-Mix Surface Course – General
 - b. Item 701 Hydrated Lime
 - c. Item 702 Bituminous Materials
 - d. Item 703A Mineral Filler
 - e. Item 703 Aggregates
- 3. American Association of State Highway and Transportation Officials (AASHTO)
 - a. AASHTO T165 Standard Method of Test for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures.
 - b. AASHTO T167 Standard Method of Test for Compressive Strength of Hot Mix Asphalt.