



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Bonifacio Drive, Port Area Manila



097.13 DPWH
06.19.2025

JUN 17 2025

DEPARTMENT ORDER)
NO. 107)
Series of 2025)

dt 6/19/2025

**SUBJECT: DPWH Standard Specification for
Item 316 – Asphalt Concrete
Pavement with BV-5 Additive
(Plastic Waste Materials)**

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 Asphalt Concrete Pavement with Plastic Waste Materials in Hot Mix Asphalt (HMA), subject to the specifications hereto attached.

The CCA has been issued to the concerned proponent, granting approval for the use of their product in DPWH projects from **May 13, 2025 to May 12, 2030**. Also, the conditional pilot pay item shall be included in the Project and Contract Management Application (PCMA) only during the said validity period.

This Order shall take effect immediately.


MANUEL M. BONOAN
Secretary

Department of Public Works and Highways
Office of the Secretary

WIN5U02162

Encl.: (1) Specification on the Use of Item 316 - Asphalt Concrete Pavement with Plastic Waste Materials, Hot-Laid
(2) Certificate of Conditional Approval

14.1.2 JDV/AGC

Specification on the Use of Item 316 – Asphalt Concrete Pavement with Plastic Waste Materials

316.1 Description

This Item shall consist of constructing an asphalt concrete pavement with plastic waste materials composed of aggregates, mineral filler, asphalt binder and additives mixed in a central plant, constructed and laid hot on the prepared base in accordance with this Specification and in conformity with lines, grades, thickness and typical cross-sections shown on the Plans.

Plastic Waste Materials shall be composed of 40% High-Density Polyethylene (HDPE), 40% Low-Density Polyethylene (LDPE), and 20% Polypropylene (PP).

316.2 Material Requirements

316.2.1 Composition and Quality of Bituminous Mixture (Job-Mix Formula)

The Job-Mix Formula, which is the primary quality control mechanism for the production of asphalt mixtures, is established to determine an economical blend and gradation of aggregates mixed with asphalt. The asphalt mixture shall be composed of aggregate, hydrated lime, additives and asphalt binder.

At least three weeks prior to production, the Contractor shall submit in writing a job-mix formula for each mixture supported by laboratory test data along with samples and sources of the components and the asphalt viscosity-temperature relationship chart to the Engineer for evaluation and approval.

Each job-mix formula submitted shall consist of the following information:

1. The source and percentage of aggregate passing each specified sieve size.
2. The percentage and type of asphalt binder to be added.
3. The mixing, laying and compaction temperature of the mixture delivered (based on the viscosity-temperature relationship chart).
4. The kind and percentage of additive to be used.
5. The kind and percentage of mineral filler to be used.
6. The asphalt mix test properties at the optimum/design asphalt content.

Based on the approved Job Mix Formula, all mixtures furnished for the project shall conform thereto within the following ranges of tolerances:

Table 316.1 Tolerance from Job-Mix Formula for Dense-Graded Asphalt Mix

Composition	Tolerances, %
Aggregates	
Passing No. 4 and larger sieves	± 7
Passing No. 8 to No. 100 sieves (inclusive)	± 4
Passing No. 200 sieve	± 2
Asphalt Binder	± 0.4

The temperature to which the asphaltic materials must be heated to produce viscosities of 170 ± 20 centistokes kinematic (0.17 ± 0.02 Pa·s) and 280 ± 30 centistokes kinematic (0.28 ± 0.03 Pa·s) shall be established as the mixing temperature and compaction temperature, respectively, in conformance with ASTM D2493M, Standard Practice for Viscosity-Temperature Chart for Asphalt Binders. Minimum and maximum range for temperature of mixture (mixing and compacting) is determined using tolerance of $\pm 10^{\circ}\text{C}$.

Should a change in source of material/s be proposed or should a job-mix formula prove unsatisfactory, a new job-mix formula shall be submitted by the Contractor in writing and be evaluated and approved by the Engineer prior to production. Approval of a new job-mix formula may require laboratory testing and verification.

The mixture shall have a Tensile Strength Ratio of not less than 0.80 when tested by AASHTO T 283, Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture Induced Damage.

The bituminous mixture shall be composed of bituminous material, aggregates, mineral filler, hydrated lime, and plastic bag materials and shall conform to the requirements of Table 316.2.

Table 316.2 Marshall Mix Design for Surface Course

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 - 14
Voids in Mineral Aggregates (VMA), %	Table 316.3
Voids Filled with Asphalt (VFA), %	65.00 – 75.00

Table 316.3 Minimum Percent Voids in Mineral Aggregate (VMA)

Nominal Maximum Particle Size ^{1,2}		Minimum VMA, %		
		Design Air Voids ³ , %		
mm	in.	3.0	4.0	5.0
1.18	No. 16	21.5	22.5	23.5
2.36	No. 8	19.0	20.0	21.0
4.75	No. 4	16.0	17.0	18.0
9.5	3/8	14.0	15.0	16.0
12.5	1/8	13.0	14.0	15.0
19.0	3/4	12.0	13.0	14.0
25.0	1.0	11.0	12.0	13.0
37.5	1.5	10.0	11.0	12.0
50	2.0	9.5	10.5	11.5

Nominal Maximum Particle Size ^{1,2}		Minimum VMA, %		
		Design Air Voids ³ , %		
63	2.5	9.0	10.0	11.0

Notes:

¹AASHTO M92/ASTM E11 - Standard Specification for Wire Cloth Sieves for Testing Purposes

²The nominal maximum particle size is one larger than the first sieve to retain more than 10 percent.

³Interpolate minimum voids in the mineral aggregate (VMA) for design air void values between those listed.

The plastic waste materials content shall be 8% 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.

316.2.2 Bituminous Material

It shall be an asphalt cement with penetration grade 60/70 and shall conform to the requirements of ASTM D946M, Standard Specification for Penetration-Graded asphalt binder for Use in Pavement Construction.

316.2.3 Aggregates

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

316.2.4 Mineral Filler

Filler material for bituminous bases or pavements shall meet the requirements of ASTM D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

316.2.5 Additives

316.2.5.1 Hydrated Lime

It shall conform to the applicable requirements of AASHTO M 303, Standard Specification for Lime for Asphalt Mixture.

316.2.5.2 Plastic Waste Material

It shall consist of high-density polyethylene, low-density polyethylene, and polypropylene with particle size of 5mm x 5mm.

316.3 Construction Requirements

316.3.1 Weather Limitations

Asphalt plant mix shall not be placed on any wet surface, or when weather conditions would prevent the proper handling or finishing of the bituminous mixtures.

316.3.2 Construction and Production Equipment

316.3.2.1 Asphalt Mixing Plant

Plants used for the preparation of asphalt mixtures shall be designed, coordinated, and operated to produce a mix uniformly within the job-mix tolerances. Batching plants shall have approved permits and licenses issued by concerned agencies, and a certificate of accreditation conforming with the DPWH requirements.

The storage yard shall be maintained neat and orderly and the separate stockpiles shall be readily accessible for sampling. Sufficient storage space shall be provided for each size of aggregate. The different aggregate sizes shall be kept separated until they have been delivered to the cold elevator feeding the drier.

316.3.2.2 Hauling Equipment

Trucks used for hauling asphalt mixtures shall have tight, clean, smooth metal beds which have been thinly coated with approved material to prevent the mixture from adhering to the beds. Each truck shall have a cover of canvass or other suitable material of such size as to protect the mixture from the weather. When necessary, such that the mixture will be delivered on the road at the specified temperature, truck beds shall be insulated and covers shall be securely fastened. Truck beds shall be drained prior to loading.

316.3.2.3 Asphalt Pavers

The equipment shall be self-contained, power-propelled units, provided with an adjustable activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of asphalt plant mix material in lane widths applicable to the specified typical section and thickness shown on the Plans.

Pavers shall be equipped with a control system capable of automatically maintaining the screed elevation as specified herein. The control system shall be automatically actuated from either a reference line or surface through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. When directed, the transverse slope control system shall be made inoperative and the screed shall be controlled by sensor directed automatic mechanisms which will independently control the elevation of each end of the screed from reference lines or surface.

The controls shall be capable of working in connection with any of the following attachments:

1. Ski-type device of not less than 9 m in length or as directed by the Engineer.
2. Taut stringline (wire) set to grade.
3. Short ski or shoe

The Contractor shall furnish the long ski, the short ski or shoe and furnish and install all required stakes and wire for a taut stringline.

Should the automatic control systems become inoperative during the day's work, the Contractor will be permitted to finish the day's work using manual controls, however, work shall not be resumed thereafter until the automatic control system has been made operative.

The Contractor shall provide and have ready for use at all times enough covers, as may be necessary, for use in any emergency such as rain, chilling wind, on unavoidable delay, for the purpose of covering or protecting any material that may have been dumped and not spread.

To achieve smooth pavements with values for the International Roughness Index (IRI) of not more than 3.0 m/km, the Contractor shall ensure that the paver control system is capable of smooth adjustments to automatically follow the surface shape (elevations and grades) required. The preferred method is laser control following a surface shape input to the onboard computer.

316.3.2.4 Rollers

The equipment shall be static steel-wheeled tandem, pneumatic-tired and vibratory steel-wheeled rollers and shall be in good condition, capable of reversing without backlash. It shall be operated at speeds slow enough to avoid displacement of the asphalt mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

316.3.3 Conditioning of Existing Surface

The existing surface, prior to cleaning, is prepared using a grader or milling machine control system capable of smooth adjustments to automatically follow the surface shape (elevations and transverse slopes) required. Immediately before placing the asphalt mixture, the existing surface shall be cleaned of loose or deleterious material by brooming or other approved means.

Contact surfaces or curb, gutters, manholes and other structures shall be painted with a thin, uniform coating of asphalt material prior to the asphalt mixture being placed against them.

316.3.4 Preparation of Asphalt Binder

The asphalt binder shall be heated uniformly to provide a continuous supply of heated asphalt binder from storage to the mixer. It shall be not be heated above 185°C.

316.3.5 Preparation of Aggregate

Aggregates for pug mill mixing shall be heated, dried and delivered to the mixing unit at a temperature sufficient to produce an asphalt mixture within the approved range. Moisture content of the aggregate shall not exceed one mass percent at the time it is introduced into the mixing unit. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid soot on the aggregate. Moisture content of the mixture from drum dryer plants shall not exceed 3.0% of the output, as determined by AASHTO T 110, Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA).

316.3.6 Mixing

Predetermined amounts of asphalt cement and mineral filler shall be added after dry mixing the heated aggregates at 180°C to 185°C with 8% plastic waste materials by weight of mix at specified mixing temperature of 145°C to 155°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).

316.3.7 Spreading and Finishing

The mixture shall be spread and struck off to the grade and elevation established. Asphalt pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

The longitudinal joint in one layer shall offset that in the layer immediately below approximately 15 cm; however, the joint in the top layer shall be at the center line of the pavement if the roadway comprises two (2) lanes, or at lane lines if the roadway is more than two (2) lanes, unless otherwise directed.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture may be placed and finished by hand tools.

The mixture shall be placed and compacted at the temperature established in the job-mix formula. The most common way to determine the temperature is with a dial and armored stem thermometer which is inserted sufficiently deep into the mixture of at least 150 mm. Other methods and apparatus used for measuring the placing and compacting temperature of the asphalt mixture shall be subject to the approval of the Engineer.

When production of the mixture can be maintained and when practical and if possible, two (2) pavers in echelon shall be used to place the wearing course in adjacent lanes.

316.3.8 Compaction

Immediately after the mixture has been spread, struck off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rollers as specified under Subsection 316.3.2.4.

The surface shall be rolled when the mixture is in proper condition and when the rolling does not cause under displacement, cracking and shoving. Rolling shall begin at the sides and proceeds longitudinally parallel toward the road centerline, each trip overlapping $\frac{1}{2}$ the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves, the rolling shall begin at the low side and progress to the high side overlapping of longitudinal trips parallel to the centerline.

Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Roller speeds shall be in the following ranges to serve as a reference during compaction; steel wheeled rollers shall not exceed a speed of 5 km/hr, vibratory rollers shall be in a range of 8 km/hr to 10 km/hr, and pneumatic tire rollers shall be in a range of 6 km/hr to 10 km/hr. If the mix is being adversely affected by rolling, the speeds shall be reduced to prevent excessive displacement. Rolling shall be continued until roller marks are eliminated and a minimum of 96 mass percent and maximum mass percent of the density of the laboratory compacted specimens prepared in accordance with AASHTO T 166, Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens has been obtained.

Any displacement occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the asphalt mixture.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers.

316.3.8.1 Compaction Trials

It shall be in accordance with the applicable requirements of Item 106, Compaction Equipment and Density Control Strips.

316.3.9 Joints

Placing of the asphalt paving shall be continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the Engineer. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course. When directed by the Engineer. A brush coat of bituminous material shall be used on contact surfaces of transverse joints before additional mixture is placed against the previously rolled material.

316.3.10 Acceptance, Sampling and Testing

The contractor shall cut full-depth samples as directed, from the finished pavement, for testing. Samples shall be neatly cut by saw or core drill. Each sample shall be at least 150 mm x 150 mm or 100 mm diameter full depth. At least one, but not more than three samples shall be taken for each full day's operation. If no core samples were taken during the day's operation, core samples shall be taken from the completed pavement for every 100 l.m. per lane. The Contractor shall supply and furnish approved material to backfill and patch the core holes immediately, left after extraction of core samples.

The samples obtained will be used to measure the thickness of the pavement. The same samples will be used to test the density of the compacted asphalt pavement by AASHTO T 166.

The compacted asphalt pavement shall have a minimum density of 96 mass percent of the density of a laboratory specimen. The asphalt pavement represented by the cores shall not be accepted if the deficiency in density is more than 1%.

The compacted asphalt pavement shall have a thickness tolerance of -5 mm. The asphalt pavement represented by the core shall not be accepted if the deficiency in the average thickness is more than 5 mm. Averaging of the density and thickness of asphalt cores is not permitted.

If the deficiency in the core thickness exceeds 5 mm, the application of an additional layer may be permitted to achieve the specified design thickness, provided that appropriate construction procedures are strictly adhered to. Alternatives such as asphalt cold milling to correct the layer thickness or removal and replacement, provided that the design thickness is not compromised.

For acceptance of the asphalt pavement, the average IRI value of lots measured in 100-meter sections shall be no more than 3.0 m/km for National Primary Roads at the time of completion.

No acceptance and final payment shall be made on completed asphalt pavement unless it meets the acceptable International Roughness Index (IRI) Value for National Primary Roads, and core test for thickness and density determination is conducted, except for Barangay Roads where the implementing office is allowed to waive such test.

316.3.11 Surface Tolerances

The surface will be checked by the use of a 3-m straight-edge at sites selected by the Engineer. The straight-edge will be applied at right angles, as well as, parallel to the centerline of the roadbed.

The variation of the surface from the testing edge of the straight-edge between any two contacts with the surface shall not exceed 6 mm.

Tests will be made immediately after initial compaction and any variations detected shall be corrected by removing or adding materials, as may be necessary. Rolling shall then be continued as specified. After final rolling, the smoothness of the course shall be checked again and any area defective in texture or composition shall be removed and replaced corrected, including removal and replacement of unsatisfactory material at the Contractor's expense as directed by the Engineer.

The completed asphalt pavement shall be subjected to surface test using an approved profiling system which shall qualify as a Class 1 roughness measurement device and conform to the latest version of ASTM E950M.

If the IRI value of the whole asphalt pavement meets the required value regardless if there are areas found to have exceeded the required IRI value, no correction shall be required, provided that the areas with exceedance have an IRI value within the tolerance limit of 0.5 m/km.

However, if the IRI value of the whole asphalt pavement falls beyond the prescribed IRI for National Primary Roads and exceeds the allowable tolerance, the contractor may opt to undertake corrective action, either overlay with or without cold milling or removal and replacement.

Cold milling shall be done with an approved equipment. Milling shall be done using cutting tools mounted on a self-propelled machine designed for milling and texturing pavement. The equipment shall have an automatic grade control that will mill a strip of minimum 1/3 lane width. Milling equipment that causes ravelling, aggregate fractures, or deterioration at joints and cracks shall not be permitted. The milling operation shall produce a pavement surface that is true in grade and uniform in appearance. The milling depth for corrective action must not compromise the design depth of the pavement.

After the correction has been undertaken by the contractor, further IRI Survey will be conducted to validate if the pavement irregularities had been eliminated. Only one IRI survey will be done after the corrective action takes place. If the IRI value of the whole asphalt pavement meets the prescribed IRI value of 3.0 m/km for National Primary Road and any 100-m sections exceeding the prescribed value are within the allowable IRI value of 3.5 m/km tolerance after correction, no reduction in payment will be made; otherwise, no payment shall be made.

The completed asphalt pavement shall be accepted on a LOT basis. A LOT shall be considered as 100 linear meters of a lane of pavement. If the length of the last lot is less than 100 m, it shall be considered as a separate lot.

LOT disincentive pay will be calculated as described in the table below:

Table 316.4 Asphalt Pavement Pay Adjustment

LOT IRI Value (m/km)	LOT Pay Adjustment, % of Item Cost
3.50 and below	100 %
3.51 and above	No payment

316.4 Method of Measurement

The area to be paid for under this Item shall be the number of square meters (m²) of asphalt pavement placed and compacted in conformance with the lines and grades as shown on the Plans, and accepted based on the thickness and density of the cores, and IRI value if necessary, in accordance with Subsection 316.3.10, Acceptance, Sampling and Testing.

316.5 Basis of Payment

The accepted quantity, measured as prescribed in Section 316.4, Method of Measurement, shall be paid for at the Contract Unit Price for Asphalt Concrete Pavement with Plastic Waste Materials, which price and payment shall be full compensation for furnishing all materials, handling, mixing, hauling, placing, rolling, compacting, labor, equipment, tools and incidentals necessary to complete this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
316 (1)	Asphalt Concrete Pavement with Plastic Waste Materials	Square Meter



CERTIFICATE OF CONDITIONAL APPROVAL

This is to certify that

BV-5 Additive (Plastic Waste Materials)

Supplied by

Bio-Vision Sustainable Solutions Corporation

No. 50, 7th Street, between 8th and 9th Avenue, Caloocan City

is duly accredited for use in DPWH infrastructure as Additive in Asphalt Concrete Pavement subject to its specifications pursuant to the provisions of Department Order No. 189, Series of 2002.

This accreditation shall remain in force until expiry date printed below, subject to compliance with the requirements of the aforementioned Department Order.

Conditional Approval Number	:	0036
Date Issued	:	May 13, 2025
Valid Until	:	May 12, 2030

ADOR G. CANLAS, CESO IV
Undersecretary for Technical Services and
Information Management Service