097.13 DPWH
05.11.2015

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

MAY 0 9 2015

DEPARTMENT ORDER)
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NO. 71)
Series of 2015)

SUBJECT: Use of Reclaimed Asphalt Pavement (RAP) in Hot Mix Asphalt

In line with the continuing efforts to upgrade the construction technology thru the adoption of successful research studies and in view of the need of setting a standard specification in a cost-effective and environment-friendly manner, this Department has approved the use of Reclaimed Asphalt Pavement (RAP) as partial replacement to coarse aggregate in Hot Mix Asphalt, maximum of twenty-five percent (25%) for Item 310 (Bituminous Plant-Mix Surface Course) Grading "D" and maximum of forty percent (40%) for Item 310 Grading "B", subject to its specifications hereto attached.

This Order shall take effect immediately.

ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways
Office of the Secretary
WIN5U01086

5.5.2 FET/RPF/JFS

USE OF RECLAIMED ASPHALT PAVEMENT (RAP) IN HOT MIX ASPHALT

1 Description

This Item shall consist of constructing an Asphalt Pavement composed of crushed reclaimed asphalt pavement (RAP), aggregates, mineral filler and bituminous material 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-section shown on the Plans.

Reclaimed Asphalt Pavement (RAP) is the term given to removed and/or reprocessed pavement materials containing asphalt and aggregates. These materials are generated when asphalt pavements are removed for reconstruction, resurfacing, or to obtain access to buried utilities. When properly crushed and screened, RAP consists of high quality, well graded aggregates coated by asphalt cement.

2 Material Requirements

2.1 Reclaimed Asphalt Pavement

Reclaimed asphalt pavement shall be processed into a granular material prior to use in hot mix applications. A typical RAP processing plant shall consist of a crusher, screening units, conveyors, and stacker. It is desirable to produce either a coarse or a fine fraction of processed RAP to permit better control over input to the hot mix plant and better control of the mix design. The processed RAP used in recycled hot mix asphalt shall be as coarse as possible and the fines (no. 200 sieve) minimized. The crusher speed shall be controlled and shall have clearance adjustment on exit gate to minimize the fracture of coarse aggregate and excessive fines generation.

2.2 Engineering Properties

2.2.1 Gradation

RAP aggregates shall at least satisfy the requirements of ASTM D692 (Coarse Aggregates for Bituminous Pavement Mixtures) and ASTM D1073 (Fine Aggregate for Bituminous Pavement Mixture).

2.2.2 Asphalt Content and Properties

The asphalt content of old pavement shall comprise approximately three to seven percent (3-7%) by weight and ten to twenty percent (10-20%) by volume of the pavement. Depending on the amount of time the original pavement had been in service, recovered RAP binder shall have penetration values from 10 to 80.

2.3 Structural Design

Conventional AASHTO and ASTM pavement structural design methods are appropriate for asphalt pavements incorporating reclaimed asphalt pavement in the mix.

2.4 Material Handling and Storage for Recycled Hot Mix

RAP is produced by milling, ripping, breaking, crushing, or pulverizing types of equipment. To ensure that the final RAP product will perform as intended, inspection of incoming RAP with

rejection of contaminated loads (excess granular material, surface treatment, joint sealant, etc.) should be undertaken.

RAP can be handled and stored as a conventional aggregate material, but should not be blended or mixed with RAP from different projects into combined stockpiles. The height of RAP stockpiles should be limited to a maximum of 3 meters to help prevent agglomeration or sticking together of the RAP particles. Stockpiling time should also be minimized to keep the moisture content of RAP stockpiles from becoming excessive. Material handling machinery, such as front-end loaders and bulldozers, should be kept from driving directly on the stockpile.

2.5 Quality Control

The same field testing procedures used for conventional hot mix asphalt mixes shall be used for mixes containing reclaimed asphalt pavement. Mixes shall be sampled in accordance with AASHTO T 168, and tested for specific gravity in accordance with ASTM D 2950.

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

ASTM D 3515 provides the references for the use of RAP in hot mix asphalt pavements.

Other related compositions and qualities shall conform to the requirements of Subsection 307.2.1, Composition and Quality of Bituminous Mixture

2.7 Bituminous Material

It shall be Penetration Grade Asphalt Cement and it shall conform to the requirements of Item 702, Bituminous Materials. The grade of the bituminous material shall be specified in the Special Provisions.

2.8 Virgin/ Fresh Aggregates

Aggregates shall conform to the requirements of Item 307.2.3, Aggregates.

2.9 Mineral Filler

It shall conform to the requirements of Item 307.2.4, Mineral Filler.

2.10 Hydrated Lime

It shall conform to the requirements of Item 307.2.5, Hydrated Lime.

2.11 Proportioning of Mixtures

The proportion of bituminous material on the basis of total dry aggregate shall be from 5.0 to 8.0 mass percent. The exact percentage to be used shall be fixed by the Engineer in accordance with the job-mix formula and the other quality control requirements.

During the mixing operation, one-half to one (0.5 to 1.0) mass percent of hydrated lime, dry aggregate basis, shall be added to the mixture. The lower percentage limit is applicable to aggregates which are predominantly calcareous.

For Item 310 - Grading "D", asphalt mix shall compose of seventy-five percent (75%) of virgin aggregates (fresh aggregate) added with twenty-five percent (25%) of RAP.

For Item 310 - Grading "B", asphalt mix shall compose of sixty percent (60%) of virgin aggregates (fresh aggregate) added with forty percent (40%) of RAP.

The mixture for this Item shall conform to the requirements of Item 310, Bituminous Concrete Surface Course, Hot-Laid.

3 Construction Requirements

Prior to the application of Item 302 (Bituminous Tack Coat), all loose stones, debris and other scattered materials on the surface of concrete pavement within the project site shall be removed. Immediately after cleaning the pavement surface, a tack coat material (emulsified asphalt) shall be applied/ sprayed with the use of hose with nozzle attached to the distribution truck.

Other construction requirements shall be in accordance whenever applicable, with Section 307.3 of Bituminous Plant-Mix Surface Course – General.

4 Method of Measurement

The area to be paid for under this item shall be the number of square meters (m^2) of asphalt pavement placed, mixed, compacted and accepted based on the thickness and density of the cores taken in accordance with Subsection 307.3.10 (Acceptance, Sampling and Testing).

5 Basis of Payment

The accepted quantity, measured as prescribed in Section 4, shall be paid for at the contract unit price for the Use of Reclaimed Asphalt Pavement (RAP) in Hot Mix Asphalt, 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:

Description	Unit of Measurement
Bituminous Concrete Surface Course, Hot- Laid (with 25% RAP)	Square Meter
Bituminous Concrete Surface Course, Hot- Laid (with 40% RAP)	Square Meter

REFERENCES:

1. Bureau of Research and Standards' Pilot Road Research Project: Final Report on the Use of Reclaimed Asphalt Pavement (RAP) in Hot Mix Asphalt (July 2014)
2. DPWH Standard Specifications for Highways, Bridges, and Airports, Volume II (2012 Edition)
3. Anderson Asphalt Philippines, Inc.
   Manila North Tollways Project
   Asphalt Works Subcontract No. SC/0010
   Revised RAP Management Plan (March 2003)
4. ASTM
5. AASHTO