FLEXIBLE PAVEMENTS OF OHIO

An Association for the development, improvement and advancement of quality Asphalt Pavement Construction.

6205 Emerald Parkway, Suite B, Dublin, Ohio 43016
888-4HOTMIX (In Ohio), 614-791-3600, 614-791-4800 (Fax)
info@flexiblepavements.org
www.flexiblepavements.org

Technical Bulletin: **Thinlays** For Use As Pavement Preservation Surface Treatments – 19Sept2017

General

The heightened interest in pavement preservation (aka, preventive maintenance) has specifiers looking for pavement treatments that are durable, long lasting, able to be placed in thin layers, and won't break the budget. A treatment developed specifically for the purpose and for use in Ohio is Thinlay Asphalt Concrete. An asphalt concrete treatment designed specifically for thin lift (¾-inch, minimum) placement, Thinlay Asphalt Concrete was developed for use in pavement preservation on structurally sound pavements that are showing signs of aging, oxidation or minor surface disintegration.

Figure 1: Paving Thinlay Asphalt.

The specifications for Thinlay Asphalt Concrete are based upon the extensive Ohio experience with other thin lift asphalt concrete materials including 404, Smoothseal (Item 424, Fine Graded Polymer Asphalt Concrete) and 404LVT.

Thin overlays, have commonly been used as preventive maintenance surface treatments. These overlays can cost effectively protect and preserve the underlying pavement structure in the same manner as other surface treatments, and with additional advantages.

Advantages of an asphalt overlay used as a pavement preservation treatment are:

- Longer life with attendant lower annualized cost (i.e. better cost effectiveness)
- Smoother, providing a higher level of user serviceability (i.e. comfort) than other treatments
- Increased pavement strength and load carrying ability

The reason for pavement preservation gaining acceptance is very simple - it provides the opportunity for extended pavement surface life at a cost that is affordable. When a Thinlay is specified, the driving public receives the additional benefit of a smooth and quiet ride that is typical of asphalt pavements. Also, annualized costs indicate that asphalt concrete treatments used as pavement preservation strategies are among the most cost-effective treatments.

Description of Candidate Projects

Pavements suitable for a surface treatment Thinlay show the following distresses:

- Dry-looking, "bony" pavements that are porous or permeable;
- Pavements that have begun to ravel;
- Pavements with extensive cracking too fine for crack sealing; or
- Pavements with cracking of the surface too extensive for crack sealing alone.

Suitable candidate projects will have no unrepaired structural (fatigue) damage and will have sufficient remaining structural capacity to last the expected life of the pavement preservation treatment. Rapidly deteriorating projects are not good candidates for pavement preservation as the rapidly declining condition may be indicative of structural inadequacy. Thinlay should be used wherever pavement preservation is the objective of a treatment. It should be placed on structurally sound pavements that are exhibiting only surface distress. Raveling and minor cracking due to oxidation are the types of distresses for which a Thinlay is ideally suited.
If significant rutting exists (>¼ inch) in a candidate pavement, the cause must be determined and

corrected. Pavement layers exhibiting plastic deformation must be removed and replaced with materials having sufficient stability to resist the stress being applied. Structural or base deformation is an indicator of the need for a structural overlay (i.e. thick overlay) or pavement reconstruction. See Appendix B of the ODOT, Pavement Design Manual, for guidance in dealing with high stress conditions.

Materials Characterization

There are four types of Thinlay Asphalt Concrete – High Traffic (HT), Medium Traffic (MED), Light Traffic (LT) and Ultralight Traffic (ULT). The differences between the four types are seen in the mix design requirements. The HT and MED types require crushed aggregates. The crushed aggregate acts to provide internal friction to the mix, leading to greater stability. Complimenting the mixture's stability is the use of binders 70-22M and PG 64-22 binder grades respectively. The LT and ULT types require natural sand and softer binders, PG 58-28 and PG 52-28, to provide more cracking resistance.

Figure 2: Thinlay Asphalt Concrete mat texture.

Thinlay Asphalt Concrete mixes are designed in the laboratory using the well established Marshall mix design method to specific parameters contained in the specification. Compaction blow counts, stability and flow requirements and VMA vary for the four types of mixes.

Description of Application

A Thinlay treatment will generally consist of a single course ¾ inch to 1-inch thick. Application thickness should be appropriate for the surface conditions and mix specified. That is, sufficient thickness must be specified to permit placement and compaction of the overlay over the existing pavement irregularities without exceeding the material's minimum or maximum layer thickness. Uniform courses are best for optimum compaction. Sufficient course thickness must be placed to ensure at least 2 times the largest aggregate particle size over high spots, and not more than 3 times in the low spots. For Thinlay Asphalt Concrete this means using a course thickness that is a minimum of 3/4 inch to a maximum of 1-1/2-inch. Pavement surfaces having greater variation will require planing (ODOT Item 254) or a leveling course prior to placement of a Thinlay.

The mix specified must be appropriate for the traffic conditions to which it will be subjected. These range from heavy trucks to the lightest traveled roads. For this purpose the specification includes parameters for traffic volumes and the mixture composition needed to ensure a successful application.

The pavement preservation concept does not necessarily preclude the use of pavement planing or a leveling course, which can provide the advantages of a smoother ride, achieving greater density in a uniform thickness, or being able to maintain curb exposure, etc. If pavement planing is desired, it is recommended that SS 897, Pavement Planing, Asphalt Concrete, Class A (Fine Planing) be specified. Research has shown that fine planing may facilitate better density with a thinlay. If a leveling course is desired, a scratch course of Thinlay Asphalt Concrete material may be specified.

Quality Control Issues

Production of all Thinlay Asphalt Concrete generally follows established ODOT quality control and acceptance testing requirements in Item 403 and S 1041. Exceptions to ODOT requirements are stipulated in the Thinlay Asphalt Concrete specification and include: the sampling frequency and allowable deviation requirements.

Manufacturing and Placement

Manufacturing Thinlay Asphalt Concrete will be similar to any conventional asphalt concrete mixture.

Paver operation differs from conventional mix methods only in that the placement of a thin lift requires increased attention to factors affecting pavement smoothness.

Obtaining high quality, smooth asphalt paving projects requires the contractor to be sensitive to all matters affecting mix manufacturing, placement and compaction. With a thinlay these issues are heightened. Uniform mix production, uniform mix temperature, uniform delivery of material to the project, uniform head of material in front of the screed, and uniform compaction, all become critically important.

Butt joints are preferred for joint construction; but, feathering and handwork are easier with the fine graded Thinlay Asphalt Concrete.

The specification requirements of Item 401 of the ODOT C&MS apply to the construction of a thinlay project except as modified by the specification. Ensuring a successful project will require attention to the following:

- The existing pavement surface must be clean and dry prior to placement of a Thinlay.
- Weather limitations are the same as conventional asphalt mixtures per 401.06 of the ODOT C&MS. Minimum pavement surface and air temperatures of not less than 50 or 60 degrees F are required prior to mix placement depending on thickness. Note: allowable time for compaction at 60 degrees F for a 1-inch course thickness is only 10 minutes). For this reason Thinlay asphalt concrete incorporates natural sand to facilitate compaction in narrow temperature windows.
- A uniform application of tack coat, set prior to paving, is necessary to promote bond with the existing pavement.
- Material is placed with conventional asphalt pavers.
- Compaction of the mix must conform to the requirements of Items 401.13 and 401.16.
- The number and types of rollers are governed by Items 401.13 and 401.16. No vibratory rollers are permitted for use if the course thickness is <1½-inch. Vibratory rollers used on thin lifts may cause aggregate degradation due to the impact force of the rolls.
- Construct hot longitudinal joints or seal cold joints per 401.17. Treat the joint using a rate that will thoroughly coat the vertical face without excessively running off.

Specifications, Pay items, Costs

Thinlay Asphalt Concrete is a specification developed by Flexible Pavements of Ohio to provide a material configured specifically for the pavement preservation application of a thin maintenance surface. The four mix types described in the specification are tailored to specific traffic applications ranging from the heaviest traffic to very low traffic roads.

The specification is complete and includes requirements for mix design, construction, measurement, payment and acceptance. The specification mostly follows ODOT practices as appropriate.

Maintenance of Traffic Considerations

Follow the conventional practices for hot mix asphalt overlays. Overlays may be placed with traffic maintained with flagman control for 2-way facilities or with temporary lane closures on multi-lane facilities. Overlays may be placed at night when weather conditions permit satisfactory compaction. Light vehicular traffic may be allowed to cross a newly placed overlay for maintenance of access, but normal traffic should be kept off the overlay until it has cooled below 150 degrees F to avoid deformation or glazing under traffic.

Conclusion

Thinlay Asphalt Concrete is a highly durable surface mixture that is ideally suited to thin pavement preservation applications.

References:

- Specification, Thinlay Asphalt Concrete, September 19, 2017, Flexible Pavements of Ohio
- Asphalt Pavement Design & Construction Guide, February 1, 2000, Flexible Pavements of Ohio
- Construction & Materials Specifications, 2016, Ohio Department of Transportation
- HOT-MIX ASPHALT PAVING HANDB00K 2000, US Army Corps of Engineers, Federal Aviation Administration publication AC 150/5370-14A, Appendix 1 (James A. Scherocman, Consultant)
- Pavement Design Manual, July 17, 2015, Ohio Department of Transportation

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Flexible Pavements of Ohio (FPO) is an association representing the asphalt paving industry in the state of Ohio to federal, state and local governments, private industry and other construction organizations. FPO supports active educational, technical and outreach programs designed to improve and advance quality asphalt construction.