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There’s become a standing joke in the Ursich household as of late. Every time the family travels together and enjoys the smooth ride of a new asphalt pavement, a quip from the occupants of the back seat is heard … “Hey Dad, feel the value!” The tongues in the sides of their cheeks are all too noticeable. I guess I have it coming to me since I’ve preached to them long and hard about choosing value over price. And, as you might expect, my most often used illustration is asphalt pavement.

I’ve learned recently that my children’s quip compares rather closely with drivers and department of transportation decision makers. They too “feel the value.” What I’m referring to are two significant studies that support the importance of pavement smoothness – but there’s more to that story. The first study was conducted for the Ohio Department of Transportation (ODOT) as part of its long range strategic plan ACCESS OHIO 2040. The second affirmation was a report by Edelman Berland prepared for the Asphalt Pavement Alliance. In both cases the studies included surveys of the driving public.

Survey Says!
The ODOT 2012 STATEWIDE CUSTOMER PREFERENCE SURVEY was conducted by the ETC Institute. It was as the title states, a survey of customer preferences and was conducted to identify and prioritize the transportation items most important to the residents and leaders of Ohio. Survey respondents were from all quarters of the state. The survey was extensive and the results enlightening. Reported among the major findings was a ranking of the “Level of Importance with Various Transportation Options in Ohio.” Eighty percent of residents, who had an opinion, thought the most important transportation option (combination of “extremely important” and “very important” responses) was maintaining the existing transportation system. Ranking second, at 76 percent, was improving the existing highway network. Following on the heels of those responses were improving public transportation network (54 percent), rail network (45 percent), bicycle/pedestrian network (37 percent), and small airport network (28 percent).

As you dig deeper into the report there is a lot of data mining to draw specific customer preferences. The following question was asked:

Which ONE of the following do you think is more important for ODOT to address over the next 5 to 10 years?

- Increasing capacity on highways to improve traffic flow (39%)
- Resurfacing highways to improve condition of driving surface without increasing capacity (58%)
- Don’t know (3%)

Figure 1
in the Resident Survey: “Which ONE of the following do you think is more important for ODOT to address over the next 5 to 10 years?” (Figure 1). Fifty eight percent of respondents chose resurfacing highways to improve condition of driving surface without increasing capacity; 39 percent chose increasing capacity on highways to improve traffic flow; and 3 percent didn’t know.

Making pavement smoother was placed highest in respondents’ rankings for pavement characteristics that should receive the most emphasis (Figure 2). Surprisingly, visibility of pavement markings — a safety issue — came in second. It’s clear to see that Ohioans’ highest preferences are that roadways be maintained in good condition, and that the maintenance practices ensure smooth riding pavement.

The Edelman Berland survey, “ENSURING DRIVEABILITY: CHALLENGES AND SOLUTIONS FOR AMERICA’S ROADS, A SURVEY OF PAVEMENT OFFICIALS AND THE DRIVING PUBLIC” (ENSURING DRIVEABILITY), had strikingly similar results as the ODOT preference survey. ENSURING DRIVEABILITY was a nationwide survey, conducted in 2013, of drivers and departments of transportation pavement decision makers. Additionally, pavement engineers, architects, developers, toll way owners and concessionaries participated in the survey.

The ENSURING DRIVEABILITY survey provides results that corroborate the importance of roadway maintenance and pavement smoothness to the driving public. When asked of their biggest complaints about the type of road they most often drive on (congestion-related responses...
respondents identified rough/damaged road surface as highest (24 percent). Traffic delays due to roadwork followed in ranking at (18 percent); traffic delays from accidents (15 percent); lack of routine maintenance (15 percent); lack of smooth surface (15 percent); poor road conditions due to weather (3 percent); and loud road noise from traffic (2 percent). Evaluating this from the contrarian viewpoint, it’s reasonable to infer the respondents place a high value on smooth roads given the fact that their biggest complaint was about rough/damaged road surfaces. If that weren’t enough, when drivers were asked why they preferred one road surface over another, 58 percent cited smoothness; validating FHWA findings that pavement smoothness is the key factor in determining highway-user satisfaction.

**Is “Feeling the Value” Good Enough?**

Drivers appear to agree with decision makers and also recognize the need for pavement maintenance (Figure 3). When asked what they prefer, the vast majority (68 percent) prefer a pavement that requires periodic maintenance, resurfaced every 10-15 years, but can be done so indefinitely. The asphalt industry has a name for that type of pavement system; it’s called Perpetual Pavement. It’s what the customer wants.

Not too long ago I had my automobile serviced. As they typically do, the service station provided a checklist of all the items they worked on. Going down the list I saw that they had a category “DRIVEABILITY.” I thought to myself how interesting it was that DRIVEABILITY was a word coined and used in the automotive industry. How fitting since that is what their business is all about – getting people from here to there in a safe, smooth and reliable way – with a little maintenance now and then. Wow, how that rings so familiar to me as an engineer in the transportation field. Isn’t that our mission? Aren’t we to be about providing roads that move people and goods in a safe, smooth and reliable way – with a little maintenance now and then? Maybe it’s time for us to recast our thinking, because what motorists value most is DRIVEABILITY!
The facts are clear: the public wants well-maintained roads, but without the hassle of road closures. In fact, more than 8 out of 10 drivers and 7 out of 10 truckers surveyed want maintenance performed during off-peak hours.

Asphalt road resurfacing can be done during off-peak hours, ensuring a consistent level of performance without inconveniencing commuters. As a rule, asphalt is smoother than concrete and smoother surfaces provide a safer, more comfortable, and high-performance ride. Smoother surfaces also result in less fuel consumption and lower vehicle maintenance costs. If well maintained, asphalt roads are “like new” after 50 years or more.

Conversely, concrete roads degrade over time and are costly and time intensive to repair, forcing drivers to deal with either damaged roads or lengthy detours and delays. Concrete rehabilitation usually means removing slabs or entire pavements; if new concrete is poured, traffic must stay off the road due to concrete’s need to cure. At the end of their service life, concrete pavements often have to be completely reconstructed from the ground up.

Edelman Berland surveyed 3,085 drivers from across the United States in March 2014 and asked them to identify the road attributes of greatest importance to them. Despite frustrations born of a lack of regular pavement maintenance, drivers and truckers alike prefer what asphalt can provide — well-maintained, smooth roads that keep them safe.

To learn more, visit www.DriveAsphalt.org

References:
8. APA 3 Infographic 8.5x11.indd 1 9/3/2014 4:39:26 PM
How far does the FPO Asphalt Industry Scholarship Program go? Literally about 8 miles; figuratively it can mean a difference of a lifetime.

2014 marks the 20th anniversary of perhaps one of the most important long-range strategic plan’s FPO has ever developed, as the 1994 plan sought ways to not only better promote asphalt and the industry but also led to the creation of the scholarship program in 1995.

For the 2014-2015 academic year, 19 students at seven Ohio universities are each receiving $2,000 scholarships toward their goal of obtaining an undergraduate or graduate degree and going into a career field of their choice. The addition of this year’s scholarships raises the program’s totals to 391 students and $504,000 that have been awarded since the FPO Asphalt Industry Scholarship Program’s inception.

While if you placed 504,000 dollar bills end to end it would literally stretch 7.95 miles, the FPO Asphalt Industry Scholarship Program has figuratively taken the asphalt industry much further in promoting the following objectives:
• Providing an incentive for students to gain knowledge in asphalt pavement technology by requiring scholarship recipients to take at least one asphalt pavement course
• Providing an incentive for colleges/universities to offer asphalt pavement coursework
• Establishing a relationship between the asphalt industry and universities to raise awareness of asphalt pavement in the academic community and foster asphalt pavement-related research
• Providing a workforce trained in asphalt pavement technology

Prior to FPO’s 1994 Long-Range Plan, Ohio universities offering degrees in Civil Engineering and Construction Management generally didn’t offer coursework in asphalt pavement technology; in the 20 years since the inception of that long-range plan, 10 Ohio universities have offered coursework in asphalt pavement technology.

And how has the 1994 Long-Range Plan helped promote asphalt use in the state? Today, more than 98 percent of Ohio’s roadway miles are paved with asphalt.
Here is a look at the 2014-15 FPO Asphalt Pavement Industry Scholarship recipients:

Barrett Paving Materials Inc.
Jessica Messick
U. of Dayton

Wayne & Debbie Brassell Asphalt Pavement Industry Scholarship
James Halterman
Ohio U.

Burgett Family/Kokosing Construction Co.
Thomas Fellure
Ohio State U.

Erie Blacktop Inc.
Grant Weirich
Ohio Northern U.

Flexible Pavements of Ohio
John Baucco
Ohio State U.

Flexible Pavements of Ohio Graduate Student Scholarship
Ahmad Dalqamouni
U. of Akron

Flexible Pavements of Ohio
Brandon Orr
U. of Akron

Flexible Pavements of Ohio
Kyle Parker
Ohio State U.

Flexible Pavements of Ohio
Alex Roth
Ohio State U.

Fred & Teresa Fracker
Nickolas Bell
Bowling Green St. U.
The 2014-15 scholarship recipients were recognized and honored earlier this year during the Ohio Asphalt Expo in March.

*Repeat Scholarship Recipient

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Ohio Asphalt Pavement Industry Scholarship Fund Contributors

The following companies and individuals have contributed to endow the Ohio Asphalt Pavement Industry Scholarship Fund through the National Asphalt Pavement Association Research & Education Foundation (NAPAREF):

Osama Abdulshafi, Ph.D.
Barrett Paving Materials Inc.*
Bowers Asphalt & Paving Inc.
Burgett Family/Kokosing Construction Co. Inc.*
Columbus Bituminous Concrete Corp.
Columbus Equipment Co.
Cunningham Asphalt Paving Inc.
Dine Comply Inc.
Erie Blacktop Inc.
William H. Fair, P.E.
Fred & Teresa Frecker
General Insurance Co.
Gerken Paving Inc.*
Hardrives Paving Construction Inc.
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John R. Jurgensen Co./Valley Asphalt Corp.*
Kenmore Construction Co.*
The Koski Construction Co.
M&B Asphalt Co. Inc.
The McLean Co.
Martin Marietta Aggregates*
Meeker Equipment Co. Inc.
Northeastern Road Improvement
Northern Ohio Paving
Northstar Asphalt Inc.*
Ohio CAT & Caterpillar Inc.*
Osterland
Schloss Paving
The Shelly Co.*
H.P. Streicher Inc.
Thomas Asphalt Paving Co.
Valley Materials Inc.

*Denotes pledges of $50,000 or more

In addition, the following companies and individuals made a supplemental contribution to enable additional scholarships:

Erie Blacktop Inc.
Wayne & Debbie Brassell
Shelly & Sands Inc.

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Ready Mix concrete element
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Asphalt paving crew
Paving with NAPA Diamond Achievement award-winning asphalt facilities and demonstrating our commitment to quality.

Lab tech testing asphalt
Providing experienced quality control labs with state of the art technologies.

Foreman and inspector
Ensuring customer service, community, safety and environment at the forefront of our business.
In the Ohio Asphalt Winter 2013-14 issue (page 16), in the article “Bye Bye Type 1 Heavy,” we alerted you that significant changes to ODOT asphalt concrete specifications were coming. The article explained the nature and effect of the expected changes. That issue and article may be viewed at http://www.flexiblepavements.org/sites/www.flexiblepavements.org/files/ohio-asphalt-pdf/ohio_asphalt-winter_12.12.13_0.pdf.

With the release of Supplemental Specification 800 and associated other supplements, dated July 18, 2014, those expected specification changes have been implemented. See http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/PagesProposalNotesSupplementalSpecificationsandSupplements.aspx for the latest specifications.

In a further attempt to aid asphalt users in adjusting to the revised specifications, we have updated our “Technical Bulletin – Specifying Asphalt Pavements in Ohio” (18July2014). The technical bulletin is printed in its entirety on pages 15-19 of this issue. The technical bulletin explains ODOT specifications and practices and includes recommendations for the selection of mix types, binder grades and layer thicknesses for common applications. We hope that owners, designers and specifiers will find it useful in understanding and applying the changes in ODOT asphalt concrete specifications.
General
High-quality pavements are the result of well-engineered pavement designs, high-quality input materials, proper placement procedures, accurate and complete contract specifications and an adequate quality assurance program. The purpose of this Technical Bulletin is to introduce the various asphalt materials available for use in Ohio, to raise awareness of the information necessary to draft complete contract specifications and to assist agencies in adopting specifications utilizing quality control and acceptance. It is not the intention of this document to supplant proven successful means of specifying asphalt pavements. However, for those agencies that desire to remain current with industry practice this document may prove helpful.

Paving Materials
This section contains a description of the asphalt materials suggested for use. It is based on the Ohio DOT Construction and Material Specifications (ODOT C&MS).

The ODOT C&MS provides a well-known high standard for paving materials and construction. It is used extensively in local government and private work.

Recent changes to ODOT asphalt concrete specifications have changed the way in which standard asphalt concrete mixes are specified. This update incorporates those changes.

Asphalt Binder
Beginning in 1997, Ohio’s asphalt industry shifted from viscosity-graded asphalt cement (AC grades) to performance-graded asphalt binder (PG grades). This new specification system for paving asphalt is one result of research conducted under the Strategic Highway Research Program (SHRP). The term “binder” rather than cement is used because the specification is intended for modified as well as unmodified asphalt cement.

Physical tests were developed to measure engineering properties of paving asphalt over a range of temperatures and rates of loading. The specification based on these tests promises more predictable performance under actual field conditions.

The asphalt binder grade adopted by ODOT for medium (normal) traffic is PG 64-22. PG stands for performance grade. The numbers represent the temperatures (in degrees Celsius) for which the binder was graded to perform. The 64 stands for the average seven-day maximum pavement temperature and the minus-22 stands for the minimum pavement temperature at which the pavement will perform satisfactorily.

See the “Grade of Binder” section (page 18) for additional discussion of binder grade options. A complete discussion of PG binders can be found in Asphalt Institute publication “SP-1, Performance Graded Asphalt Binder Specification and Testing.”

Mixtures
The asphalt mixtures suggested for use are Standard ODOT C&MS Items with the exception of 404LVT described under “Specialty Mixes” (page 19). These mixtures are available from asphalt mix producers throughout the state. Many asphalt mix producers have developed their own mixtures for special uses.

The ODOT C&MS includes mixtures that are formulated in one of two ways – (1) recipe mixes formulated by ODOT and (2) formulations by the contractor using a mix design methodology. The items in those two groups are as follows:

Mixtures Formulated By ODOT
301 Asphalt Concrete Base
For this Item, ODOT specifies the proportion of coarse and fine aggregate in terms of the percentage passing the No. 4 laboratory testing sieve and the percentage of asphalt binder. Both of these factors may vary somewhat from one asphalt mix producer to another depending upon the characteristics of the aggregates being used.

The ODOT formulations were based on laboratory tests on aggregates from the many sources throughout Ohio and on experience in the field. They have been called “historical mixtures” and are on record for repeated usage.

ODOT C&MS Section 403 has provided for production quality control and acceptance of the 301 mixture. The contractor observes production operations, conducts tests and prepares daily reports of all activities affecting the quality and quantity of mixtures produced and shipped to the project site. Acceptance of the mixture for composition is based on monitoring the contractor’s quality-control testing and on the analysis of samples by ODOT.
Mixtures Formulated By the Contractor

302 Asphalt Concrete Base
441 Asphalt Concrete, Type 1 and 2 (Surface and Intermediate Courses)
442 Superpave Asphalt Concrete, 12.5 mm, 9.5 mm or 19 mm, Type A or B (Surface and Intermediate Courses)

For Item 302 the contractor is required to develop a job mix formula (JMF) within limits for composition and within limits for characteristics of the mixtures determined by laboratory tests. Production quality control and acceptance of the mixture are as provided in ODOT Section 403.

For Items 441 and 442, the contractor is required to develop JMFs within limits for composition and within limits for characteristics of the mixtures determined by laboratory tests. The contractor also is required to do quality-control testing.

Item Descriptions & Uses

Item 301 Asphalt Concrete Base is an asphalt base course mix for use in pavement designs where a base layer thickness of 3 inches (75 mm) or more is needed. Item 301 may be placed directly upon prepared subgrade, aggregate base, or existing pavement surface. This may be specified as: ODOT Item 301 Asphalt Concrete Base, PG 64-22.

Item 302 Asphalt Concrete Base is an asphalt base mix having the same uses as Item 301 but incorporates larger size aggregate. Its minimum layer thickness is 4 inches (100 mm). The gradation limits are not as constrained and they ensure the coarse aggregate is dominant in providing a strong aggregate structure. That structure is considered necessary to resist shear stresses induced by heavy traffic. This may be specified as: ODOT Item 302 Asphalt Concrete Base, PG 64-22.

Item 441 Asphalt Concrete, Types 1 and 2
Specifications for these materials changed on July 18, 2014. All mixtures for these items are designed by the contractor. Composition and mixture requirements are in ODOT C&MS Section 441. These mixtures are designed for traffic applications of less than 1,500 average daily truck traffic (ADTT). Section 441 also contains requirements for the contractor’s production quality-control operations.

Type 1 uses a dense gradation with a ½-inch, minus top size and is comparable to Items 403 and 404 (1997 ODOT C&MS) Type 2 uses a dense gradation with a ¼-inch, minus top size and is comparable to Item 402 (1997 ODOT C&MS) as to aggregate top size and uses. See Table 2 for the specification descriptions for 441 mixes, (page 17).

Item 442 Superpave Asphalt Concrete mixtures are designed by the contractor based upon Asphalt Institute’s “Superpave Mix Design” manual (SP-2). Composition and mixture requirements are contained in ODOT C&MS Section 442. Mixtures are denoted by the nominal maximum aggregate size (NMAS). [Note: NMAS is defined as one sieve larger than the first sieve to retain more than 10 percent in a gradation.] In Ohio, the 9.5 mm mix is used for variable thickness, scratch and leveling courses, and surface courses for medium-traffic pavements. The 12.5 mm mix is being used by ODOT on heavily traveled pavements. It is the predominant Superpave surface course mix. Intermediate courses use the 19 mm mix. See Table 2 for the specification descriptions for 442 mixes.

Acceptance
“Acceptance” is the term used to describe the contractual procedure by which an agency determines the acceptability of an asphalt material that has been mixed, placed and compacted as the final product in the construction of an asphalt pavement. Asphalt mixtures composed under the requirements of 441 and 442 mixes are accepted either by the requirements of Item 446 (i.e. density acceptance) or 448 (i.e. mixture composition acceptance). Further discussion of these acceptance methods is provided below in section “Item Specification Under Which Material Will Be Placed” (page 17).

Contract Specifications
Contract specifications need to clearly convey the intent of the agency/owner. To accomplish this there are several pieces of information that must be communicated when specifying asphalt mixtures. That information includes:
- Project dimensions & course thickness
- Item specification under which material will be placed
- Description of material
- Traffic designation
- Grade of binder
- Item quantity
- Language for specifying asphalt composition
- Method & point of acceptance

Project Dimensions & Course Thickness
Project dimensions include the width, length, thickness and any other dimensions needed to identify the location of the work and the area to be covered. The asphalt mixture paving process has the unique ability to smooth out rough, irregular pavement surfaces. To accomplish this the asphalt quantity must be sufficient to fill in low spots while maintaining the desired course thickness over bumps. Project dimensions are needed to ensure the proper quantity of asphalt is being placed per unit of area. While a nominal or average thickness is customarily shown on the plan, the quantity is calculated to a volume or weight to be placed per unit area. This is referred to as the “yield” and is the measuring stick to ensure the plan dimension is met when placing asphalt mix over an irregular surface.

A rule of thumb when specifying layer thickness is that the layer should be two to four times the aggregate top size in the mix. For instance, the layer thickness for a surface course mixture with aggregate having a top size of 3/8 inch should normally not be less than 1¼ inch. The purpose of this rule is to ensure that sufficient layer thickness exists to promote consolidation of the mixture when the rolling equipment applies compaction. Usually, thicker courses are used than that determined by the “rule of thumb.” This is done to provide sufficient asphalt to correct irregularities in the surface being overlaid, promote mixture
density and improve smoothness. Layer thickness guidelines are provided in Table 1.

### Table 1 – Layer Thickness Guidelines

<table>
<thead>
<tr>
<th>Asphalt Mixture</th>
<th>Thickness (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Courses</strong></td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>1¼ - 1½</td>
</tr>
<tr>
<td>Superpave 9.5 mm</td>
<td>1¼ - 1½</td>
</tr>
<tr>
<td>Superpave 12.5 mm</td>
<td>1½ - 2½</td>
</tr>
<tr>
<td><strong>Intermediate/Leveling Courses</strong></td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>1 - 1½</td>
</tr>
<tr>
<td>Type 2</td>
<td>1½ - 4½</td>
</tr>
<tr>
<td>Superpave 9.5 mm</td>
<td>1 - 1½</td>
</tr>
<tr>
<td>Superpave 19 mm</td>
<td>1½ - 4½</td>
</tr>
<tr>
<td><strong>Base Courses</strong></td>
<td></td>
</tr>
<tr>
<td>301</td>
<td>3 - 10</td>
</tr>
<tr>
<td>302</td>
<td>4 minimum</td>
</tr>
</tbody>
</table>

### Item Specification Under Which Material Will Be Placed

Asphalt work items bid using ODOT specification designations require the designer to identify in the contract line item the specification under which the asphalt mixture is to be composed, and the item number for which it will be accepted. An example is the following:

**Item 441, Asphalt Concrete Surface Course, Type 1, (446), PG64-22**

Item numbers (e.g. 441) provide reference to the details needed by the contractor to manufacture and place asphalt, and explain the manner in which the material will be accepted (e.g. 448) by the agency. The agency must select the appropriate item of work for the project conditions. Item specifications typically used in Ohio local government projects and commercial paving work are those established in the ODOT C&MS. The ODOT Specifications commonly used for surface and intermediate courses are Items 441 and 442 with 446 or 448 acceptance – for base courses, items 301 and 302.

**446 Acceptance** - The acceptance of asphalt mix placed under the provisions of Item 446 is based upon monitoring contractor quality-control tests. Acceptance of the compacted mixture is based on the level of density attained as sampled by the contractor and tested by ODOT. The intent of the density specification is to encourage thorough compaction of asphalt mixtures. This enhances pavement longevity and resistance to rutting that can occur under heavy traffic. Item 446 is only to be used when constructing layers having uniform lift thickness and the pavement foundation is sufficiently firm to support the compaction effort of the rolling equipment.

**448 Acceptance** - Acceptance of Item 448 mixtures for composition is based on monitoring the contractor quality-control testing performed at the mixing plant and on the analysis of samples by ODOT for mixture proportions. In this case the asphalt mixture is separated into its components (i.e. aggregate gradation and asphalt binder content) and a comparison is made to the mixture’s approved JMF. If the proportions of the hot-mix asphalt produced compare within acceptable tolerance of the JMF, then the material is deemed acceptable. If a uniform thickness course > 1-inch thick and 1-mile long is being placed, 448 may require density quality control and acceptance per Supplement 1055.

In recent years ODOT has adopted the Superpave technology. Specification 442 outlines ODOT’s Superpave mix design requirements. The Ohio specification outlines requirements for a Type A and Type B mixture. The major difference between the two is the coarse aggregate angularity requirement. The Type A mix has the higher angularity requirement [Type A (95% fracture), Type B (65% fracture)].

### Description of Material

A description of the asphalt mix material desired for use is also a necessary part of every asphalt paving project. Material description provides information as to the material type, its gradation and whether the material is for use as a base, intermediate or surface course. A catalog of descriptions is provided in Table 2.

**Traffic Designation**

Asphalt mixtures for surface and intermediate courses are formulated for the kind of traffic that will use the pavement. Depending on the type of mixture being specified, plans will include the type of traffic or the quantity of truck traffic. Superpave mixtures (Item 442) use Average Daily Truck Traffic (ADTT) as the means of designating formulation criteria. ODOT uses 441 mixes for normal traffic of < 1,500 ADTT. This truck traffic may be too high for good performance on urban streets. Some suggestions for specifying mixes for various traffic designations are as follows:

- **Light-traffic** applications for such purposes as residential driveways, play areas, walkways and paths for bicycles and golf carts, certain light-traffic local roads, light-traffic residential streets and infrequently used parking lots for cars. Use 441 mixes or special light-traffic mixes such as 404LVT or SS 823.
Medium-traffic applications include all roads, streets and parking lots used by less than about 300 heavy trucks per day per traffic lane. Use 441 mixes or 442, 9.5 mm mixes.

Heavy-traffic applications generally include roads and streets used by more than about 300 heavy trucks per day per traffic lane. Mixtures formulated for heavy-truck traffic are relatively stiff. For that reason, they should be specified only for pavements designed structurally for heavy-truck traffic. Use 442 12.5 mm and 19 mm mixes.

Grade of Binder
The asphalt binder grade specified depends upon the climate, the location of the material in the pavement cross-section and the type of traffic to which the pavement will be exposed. Table 3 provides binder grades specified by ODOT for various standard material types.

Table 3 – Recommended Binder Grades

<table>
<thead>
<tr>
<th>Binder Grade</th>
<th>To Be Used With:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 64-22</td>
<td>301 – Asphalt Concrete Base</td>
</tr>
<tr>
<td></td>
<td>302 – Asphalt Concrete Base</td>
</tr>
<tr>
<td></td>
<td>441 – All surface and intermediate courses having light or medium traffic</td>
</tr>
<tr>
<td>PG 64-28</td>
<td>442 – Asphalt Concrete Intermediate Course</td>
</tr>
<tr>
<td>PG 70-22M</td>
<td>442 – Asphalt Concrete Surface Course</td>
</tr>
<tr>
<td></td>
<td>441 – Asphalt Concrete Surface Course, Type 1, Heavy Traffic</td>
</tr>
<tr>
<td>PG 76-22M</td>
<td>442 – High Stress Paving Mixtures*</td>
</tr>
<tr>
<td>PG 88-22M</td>
<td>442 – Extreme High Stress Paving Mixtures*</td>
</tr>
<tr>
<td></td>
<td>bridge deck waterproofing</td>
</tr>
</tbody>
</table>

1. Agencies will sometimes find it useful to change the binder grade from the default grade shown in the ODOT Specifications for heavy traffic or greater longevity.
2. High-stress paving mixtures are specially formulated to mitigate surface deformation taking the form of rutting, depressions or shoving. For additional information on the treatment of high-stress locations, reference the ODOT Pavement Design Manual, Appendix B.

Asphalt binders are specified in Item 702.01 of the C&MS. Un-modified, Performance Graded (PG) binders are specified by reference to AASHTO M320-10. Modified binders are specified in Table 702.01-1. In looking at M320-10 one might infer that a wide variety of binder grades are available for specification. In practice, only a few essential grades are generally available and used in Ohio.

PG 64-22 is the basic grade of un-modified binder used for climate conditions in Ohio in normal (medium) traffic applications. Binder grades for use in heavy and slow-moving traffic applications are PG 70-22M and PG 76-22M. Under ODOT Specifications, grades including the “M” designation are polymer-modified binders.

PG 64-28 is used in 442 intermediate courses. It is not required to be a modified asphalt binder though it is used in pavements for heavy-traffic use.

A relatively new grade of highly polymerized asphalt, PG 88-22M, has recently been added to ODOT Specifications. This material may be used for a variety of applications. It provides enhanced stability for extreme resistance to deformation (i.e. rutting and shoving), improves cracking resistance and increases pavement strength – allowing for pavement thickness reduction. PG 88-22M is also useful for low-permeability asphalt mixtures used for bridge deck waterproofing.

Traffic Considerations When Choosing Binder Grade
- For ordinary, constantly moving traffic applications, use the standard 441 mix types with PG 64-22. For heavy, constantly moving traffic applications use the standard 441 or 442 mix types with PG70-22M. Where deformation is a particular concern, because of very heavy traffic and/or conditions that cause traffic to be slow-moving, stopping, starting or turning, Use 442 mixes and change the binder type with an “as per plan” note to PG 76-22M or PG 88-22M.

Item Quantity
Unit price contracts require that the quantity of each type of hot-mix asphalt be determined and provided in the contract documents for bidding purposes. Units of measure used are either cubic yards or tons. ODOT Specifications use cubic yards. By using cubic yards, the desired thickness is obtained without quantity overages. This is accomplished by taking into consideration the unit weight (pounds per cubic foot) of the asphalt mixture during placement operations.

Language for Specifying Asphalt Mixture Composition
Ohio utilizes quality assurance (QA) specifications for the production of asphalt mix. Under QA provisions, prior to the start of mix production for a project, the contractor has the responsibility of developing a job-mix formula and submitting it for approval by the agency. In many cases, local agencies find themselves in the position where they are unable to fulfill this role. Due to a lack of knowledge of asphalt mix design they may be unable to determine if a contractor’s JMF meets the mix design requirements. In such instances it is beneficial for the agency to rely upon the expertise of ODOT by requiring the use of mixtures that have been previously approved by the department.

To accomplish this, the following contract language is suggested:

“Compose the asphalt mixture with aggregate, asphalt binder, and modifiers (if specified) meeting Ohio Department of Transportation (ODOT) requirements. Prior to producing asphalt mix for this contract, submit a Job Mix Formula (JMF) for approval.

Include in the JMF the mix type proposed for use, aggregate source, type and gradation, percentage of asphalt binder by weight of mixture, grade of asphalt binder, description and source of modifier (if being used), and unit weight of the mixture. Use a JMF that meets all requirements established in this contract and has previously been approved for use on ODOT work. Where no previously approved JMF is available, develop one meeting all criteria established in this contract.
Ohio Asphalt demonstrated effectiveness. ODOT Supplemental Specifications 826 and 857 have also demonstrated good success.

There are many specialty mixes available to treat a variety of pavement conditions. Modifiers such as polymers, fibers and stiffeners play an important role in enhancing mix performance. Provided below is a sampling of such mixtures:

For preventive maintenance surface treatments Thinlays (thin asphalt overlays) have been used over the past 30 years with very good success. Smoothseal, a fine-graded polymer-modified asphalt mixture, can be specified for pavements having good structural integrity and only the need for surface restoration. ODOT Item 424, Fine Graded Polymer Asphalt Concrete, outlines the mixture requirements.

For rutting resistance stone mastic asphalt, ODOT Item 443, combines high-internal-friction mixes with polymer binders to resist deformation induced by heavy truck loads in high-stress areas. Fiber-modified mixtures and mixtures using stiffeners, ODOT Supplemental Specifications 826 and 857 have also demonstrated effectiveness.

For longer life the use of polymers as a mix additive has proven very successful. Ohio has experience with pavement surfaces lasting as long as 29 years when latex polymer (SBR) has been used in the hot-mix asphalt. SBS polymer-modified mixes – as well as ground tire rubber (GTR) – are similarly promising.

For low-volume traffic roads and streets FPO has developed a specification known as 404LVT to provide a 404-like, fine-graded mixture especially suited to use on low-traffic volume roadways. The Specification 404 LVT is based on ODOT’s historical mix formulations and can be found on the FPO website.

Conclusion Item specifications typically used in Ohio local government projects and commercial paving work are those established in the ODOT C&MS. The ODOT Specifications commonly used for surface and intermediate courses are Items 441 and 442 – for base courses, items 301 and 302.

Contract specifications need to clearly convey the intent of the agency/owner. This is accomplished by ensuring that the following information is communicated to the contractor:

- Project dimensions & course thickness
- Item specification under which material will be placed
- Description of material
- Traffic designation
- Grade of binder
- Item quantity
- Language for specifying asphalt composition
- Method & point of acceptance

An example item description is: 441, Asphalt Concrete Surface Course, Type 1, (448), PG 64-22

Under ODOT’s QA Specifications the responsibility for development of the job mix formula and the quality control during mixture production lies with the contractor. The agency approves the contractor’s mix design and performs the acceptance testing.

Specialty mixes are available to treat a variety of pavement conditions. Preventive maintenance, high-stress areas and increased pavement life are all instances where modifiers have demonstrated good success.

All reasonable care has been taken in preparation of this Technical Bulletin. However, Flexible Pavements of Ohio can accept no responsibility for the consequence of any inaccuracy that it may contain.

References:
- Pavement Design Manual, July 2014 with revisions, Ohio Department of Transportation
- Construction & Materials Specifications, 2013, Ohio Department of Transportation and SS 800 dated July 18, 2014
- Asphalt Institute publication SP-1, Performance Graded Asphalt Binder Specification and Testing
- Asphalt Institute publication SP-2, Superpave Mix Design
- QA/QC Presentation, William Fair, P.E., Flexible Pavements of Ohio
Every day in 2011, more than 48 million tons of goods — worth some $46 billion — were transported across the United States, and more than 73 percent of those tons were carried over the nation’s highways and roads.¹ According to the Federal Highway Administration (FHWA), 49.4 percent of vehicle miles traveled (VMT) on the Federal-Aid Highway System failed to meet the standard of “good ride quality” in terms of smoothness and 18 percent failed to reach the less stringent “acceptable” level.² FHWA notes that pavement condition has a “… direct impact on vehicle operating costs in the form of increased wear and tear on vehicles and repair costs. Poor pavement can also impact travel time costs . . . and can have an impact on crash rates.”³ Given the value of goods being transported over U.S. highways and roads, and the effect of road condition on costs, time and safety for the public, it is critical that our nation’s highways and roads be kept in proper condition.

Many agencies apply pavement preservation techniques to cost effectively maintain or improve roads in a good condition. Pavement preservation is defined in the Moving Ahead for Progress in the 21st Century (MAP-21) Act, which was signed into law in July 2012, as “programs and activities employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety, and meet road user expectations.”⁴ The precept of pavement preservation is that it is more cost effective to maintain pavements in good condition rather than allow pavements to deteriorate to such a condition that costly and time-consuming rehabilitation or reconstruction is the only recourse.

Several pavement preservation techniques are available; of those, Thinlays™ offer the highest value to public and private pavement owners alike. Thinlays are a suite of asphalt mixes that can be placed at a depth of 5/8 inch or more.

Thinlays share many of the benefits seen in overlays and inlays; extended pavement life, smooth ride, a modest improvement in pavement strength, enhanced safety and responsible use of natural resources through reuse and recycling. A comparison of the versatility, benefits and costs of the palette of preservation treatments reveals Thinlays rank the highest.

NAPA Position on Thin Asphalt Overlays for Pavement Preservation

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The Need for Maintaining Good Pavement Condition through Pavement Preservation

NAPA supports a well-funded asset management program that includes pavement preservation as one of the tools available to ensure a desired state of good repair over the lifecycle of a pavement at minimum practical cost. The focus for America’s highway and road network has shifted from construction in the 1950s through the 1980s to current maintenance and restoration efforts. America’s road network is mature, with lane mileage due to new construction increasing only 8 percent from 1980 to 2009. Given that the condition of highway infrastructure can have large effects on the economic outcomes of infrastructure investment, it is vital that U.S. highways and roads be kept in good condition. For this reason, as well as to preserve the estimated $1.75 trillion invested in the national highway system, pavement preservation is a standard practice for many highway agencies.

MAP-21 recognizes that the nation’s highway system is mature, and that pavement performance must be monitored and maintained. Agencies will be required to report on road conditions to assure taxpayers that their money is being well spent. Pavement preservation is a cost-effective approach to maintaining and improving the condition of existing highways and roads and meeting performance goals.

Thinlays in Pavement Preservation

Asphalt overlays are well established as effective pavement maintenance and preservation strategies. The versatility of asphalt to be designed, manufactured and constructed in any pavement thickness makes it well suited for preservation projects where surface conditions vary and only minimal thickness is needed. As states have shifted focus to pavement preservation, thin asphalt overlays, now termed “Thinlays” have seen greater use. Thinlays successfully extend the life of structurally sound pavements. Thinlays can be as thin as 5/8 inch and of greater thickness as surface conditions necessitate; the result is optimization of material use, benefits received and pavement preservation dollars invested.

The engineering viability of using Thinlays has been demonstrated in research, field studies, demonstration projects and long-term performance tests and analysis. Significant advances in materials, mixture design and construction of surface layers during the past few decades have increased the range of thin asphalt overlays’ applications, especially for preservation. Research has shown thin overlays perform better than other pavement preservation treatments under more pavement conditions and traffic levels. When used appropriately, thin asphalt overlays are safe, reduce costs and are sustainable through the incorporation of recycled materials. Construction is fast, with less impact on drivers, and there are additional environmental benefits, such as noise reduction. In addition, thin asphalt overlays provide a smooth driving surface, improving ride quality and reducing fuel consumption compared to rough pavements.
Pavement structure must be considered in pavement preservation. Though pavement preservation tends to focus on functional benefits received from preserving the pavement surface, the benefit received from protecting the pavement structures is real and deserves recognition. Thinlays can actually improve the structural capacity of pavements that are structurally sound, greatly extending the pavement’s life. By minimizing strains at the bottom of an asphalt pavement, distresses can be limited to the surface where they are easily managed through Thinlays and other preservation treatments.

So long as bottom-up fatigue cracking is not present in the lower levels of a pavement, Thinlays can be strategically placed to construct a long-life Perpetual Pavement over time. Because Perpetual Pavements are designed to minimize fatigue in the lower levels of a pavement, periodic maintenance of the pavement surface is all that is required to keep them in good working condition.

NAPA’s goal is to ensure that Thinlays are the pavement preservation tool of choice for federal, state and local transportation agencies. This position statement is offered to advance the use of Thinlays in pavement preservation applications. It is intended to provide leadership and direction to NAPA members and customers for the use of thin asphalt overlays in the United States.

**NAPA Positions:**
1. Surface distresses and structural adequacy of the road must be evaluated prior to using pavement preservation treatments, including Thinlays.
2. Thinlays for pavement preservation offer economic, engineering and sustainability benefits.
3. Thinlays should be considered as part of any pavement preservation program.
4. Consideration should be given to protecting the pavement structure and the benefits of creating a Perpetual Pavement, particularly for thinner, lower-volume pavements, through the strategic application of Thinlays over time (staged construction).
5. Selection of Thinlays should include a review of the economic and engineering suitability.
6. Restrictions that prohibit the use of Thinlays due to possible addition of structural capacity and without technical basis should be removed from specifications and guidance.
7. Milling prior to overlay should be allowed, and in some cases encouraged, to allow removal of surface distresses and provide optimum smoothness for long-term performance.
8. The use of warm-mix asphalt (WMA) should be allowed for the construction of Thinlays.
9. The use of reclaimed asphalt pavement (RAP) and/or reclaimed asphalt shingles (RAS) should be permitted for Thinlays.

SMOOTHSEAL
FOR THINLAYS

In Ohio, the premier product for Thinlay™ use is “Smoothseal,” more formally known as ODOT Item 424, Fine Graded Polymer Asphalt Concrete. This product was developed from previous successful specifications to fulfill the need for a surface course that is durable, long lasting and able to be placed in a thin layer for the preventive maintenance, surface treatment application desired by ODOT for pavement preservation. With an aggregate size specification of 95 to 100 percent passing the 3/8 sieve, it is formulated to be placed at a thickness of 3/4 inch to 1 1/4 inch, depending on surface conditions.

There is both a Type A and Type B, Item 424. Type A is a recipe sand mix intended for residential street use, while Type B is for highways. Type B is the most commonly used Item 424. In 2013, ODOT bid 24 projects for nearly 72,000 cubic yards of Item 424, Type B.


For more information, contact NAPA Director of Engineering Kent Hansen, P.E., at khansen@asphaltpavement.org or 301-731-4748.

References
3. ibid., Exhibit 3-3.
Last winter’s severe weather brought the issue of pothole patching to the forefront of the news once again. Potholes are a common enemy of all pavement owners. Fortunately, there is good information available on how best to cope with the problem.


The report generally confirms the findings of the earlier Strategic Highway Research Program (SHRP) 1 study of patching done under projects H-105 and H-106 and incorporated into the SHRP-H-348, “Asphalt Pavement Repair Manuals of Practice,” first printed in 1993. It also confirmed the extent to which the recommendations of the earlier study have been adopted by maintaining agencies. The “Manuals of Practice” can be downloaded at http://onlinepubs.trb.org/onlinepubs/shrp/SHRP-H-348.pdf.

In 1999, FHWA followed up with a Tech Brief, FHWA-RD-99-202, which summarized an evaluation of patching methods and confirmed some of the recommended best practices. The Tech Brief can be downloaded at http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=144.

Several cost-effective practices for patching have been verified through the studies:

- Throw and Roll patching with a proprietary cold mix is likely the most effective method of temporary patching in inclement weather.
- Semi-permanent patches using plant mixed-asphalt concrete and best techniques for preparation and compaction yield the longest lasting results.
- Spray-Injection patching can be most cost effective for some types of patching.

If you also have to deal with the public relations aspects of pothole repair, you will also want a copy of the APWA’s, “The Hole Story: Facts and Fallacies of Potholes,” available at http://www2.apwa.net/bookstore/detail.asp?PC=SPR.HOLE

These reports are a must-read for agency personnel responsible for pavement patching.
Mark Your Calendars

Ohio Transportation Engineering Conference
Oct. 28-29, 2014
Columbus Convention Center
400 North High St.
Columbus, Ohio 43215

The Ohio Transportation Engineering Conference (OTEC) is a two-day event attended by more than 3,000 transportation professionals from throughout the nation. OTEC is co-sponsored by the Ohio Department of Transportation and The Ohio State University.

FPO is organizing an Asphalt Technology session on Tuesday, October 28. Visit the OTEC website at http://www.otec.org for up-to-date conference information as well as archived material from previous conferences.

International Conference on Perpetual Pavement 2014
Oct. 30-31, 2014
Columbus/Polaris Hilton Hotel
8700 Lyra Dr.
Columbus, Ohio, 43240

The International Conference on Perpetual Pavement has been scheduled for October 30-31 at the Columbus/Polaris Hilton in Columbus. The previous International Conferences on Perpetual Pavement in 2006 and 2009 brought together more than 250 experts from more than a dozen foreign countries and from at least 35 states, including representatives from 19 state departments of transportation. This conference will review progress in the research and implementation of perpetual pavements, including the design concept, modeling and performance since the previous conference in 2009.

Visit the conference website at www.ohio.edu/icpp/ for additional information regarding this event.

Ohio Asphalt Paving Conference
Feb. 4, 2015
The Fawcett Center
The Ohio State University
2400 Olentangy River Rd.
Columbus, Ohio 43210

The Ohio Asphalt Paving Conference is a collaborative effort of state and local government, academia and the asphalt industry to present practical, usable technologies and strategies for the design and construction of asphalt pavements.

Visit FPO's website at www.flexiblepavements.org for more information regarding this event.

Ohio Asphalt Expo
March 3-4, 2015
Columbus/Polaris Hilton Hotel
8700 Lyra Dr.
Columbus, Ohio, 43240

The Asphalt Expo is Ohio’s premier asphalt pavement event with multiple, concurrent educational sessions and an indoor and outdoor trade show and exhibition. If you construct, inspect, manage or maintain local or private transportation infrastructure, the Ohio Asphalt Expo has the information you need to ensure a successful, long-lasting asphalt pavement.

Visit the Expo website at www.ohioasphaltexpo.org for more information.
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