

**GUIDE FOR SPECIFYING ASPHALT PAVEMENTS
FOR LOCAL GOVERNMENTS AND NON-GOVERNMENTAL APPLICATIONS
(USING INDOT STANDARD SPECIFICATIONS SECTION 402)**

This Guide incorporates the latest asphalt pavement technologies. It attempts to present the best practices/procedures and processes, but it is not intended to replace sound engineering knowledge, judgment and experience.

Indiana Department of Transportation (INDOT) Standard Specifications, Section 402 contains specifications and acceptance methodology that is suitable for most asphalt pavements with minimal exceptions. Section 402 can be applied with minor revisions to non-state highway pavements such as local roads and commercial applications. Section 402 is especially suitable to agencies because they are without access to the infrastructure for independent testing and acceptance methods referenced in Section 401 (that are available through INDOT). Section 402 provides a system of production, quality control, placement and standards for workmanship and materials that assures reasonable conformance with current best practices and expectations of pavement performance. This Guide references 2014 INDOT Standard Specifications, Section 402 and 401.

This Guide is intended to provide a narrative of the contents of Section 402. It also provides comments and in some cases offers optional information that may be more cost effective or applicable to specific lower traffic volume applications. Options and suggestions are denoted in *Italics*. The Guide also includes [links](#) to the appropriate locations on INDOT's website for more detail.

This Guide is divided into two parts: Part A, references materials and production of asphalt paving materials, Sections 402.01 through 402.09. Part B references construction and placement, Sections 402.10 through 402.20. The specific sections discussed in Part A could be referenced by themselves when the agency wishes to purchase asphalt mixture from a producer, but the mix is placed by the agency or others. Part B references the sections applicable to placement and compaction of asphalt mixes as a finished in-place product.

The 2014 version of the INDOT Specifications, Recurring Special Provisions, and Supplemental Specifications are applicable. A glossary of terms and acronyms is contained on the APAI website. The website also contains asphalt pavement recommended specifications for local governments and non-government applications.

The production and placement of most types and uses of dense graded asphalt paving materials are referenced or cross referenced to Sections 401 and 402. Stone Mastic Asphalt (SMA) Surface Mix is contained in Section 410. Asphalt paving materials specified for approach material is contained in Section 610. Patching and widening are addressed in Section 304, but are cross referenced back June, 2014

to Section 402. HMA rumble strips, HMA Wedge and Level, Temporary HMA mix, and HMA Curbing are all contained within Section 402.

Effective in September, 2013 and contained in the 2014 version of INDOT Standard Specifications, Section 402 became described as “one or more courses of miscellaneous mixtures”. In prior editions, the description included “one or more courses of HMA base, intermediate or surface mixtures” Pay items for HMA base, intermediate and surface courses were also removed from this section. By reinserting the pay items for HMA Base, intermediate and surface, and revising the Section 402 description, this section can be utilized for most paving applications.

INDOT Standard Specifications, Section 402-
Hot Mix Asphalt Pavements
Part A
(Materials and Mix Production)

402.01 Description

This section defines the work to follow in Section 402 and consists of one or more courses of (*HMA base, intermediate, surface mixtures or other*)* miscellaneous asphalt pavement application. The term “asphalt pavement” or “asphalt paving mixtures” will be used throughout this Guide to include both Hot Mix Asphalt (HMA) and Warm Mix Asphalt (WMA). INDOT Standard Specifications allow mixtures to be produced as warm-mix asphalt (WMA) only by using a water injection foaming device or as Hot Mix Asphalt (HMA), at the contractor’s option. [\[Link to Section 400\]](#)

**The above language was deleted in the current version of Section 402, but should be reinserted for non-INDOT application.*

402.02 Quality Control

This Section sets the standards for contractor quality control. The first part relates to the production of the asphalt paving mixtures and requires that it be supplied from a Certified HMA Plant in accordance with [ITM 583](#) – Certified Hot Mix Asphalt Producer Program. (CHMAPP) [Certified HMA Producers List](#). Certification of an HMA plant sets standards for the contractor’s quality control program for producing asphalt mixtures. Standards are established for sampling, testing, testing equipment, personnel qualifications and independent audits by INDOT. The Certified Producer is required to have a written Quality Control Plan at the plant site.

The second part of this section applies to the transportation, placement and compaction of asphalt paving mixtures. The Contractor is required to submit a quality control plan (QCP) in accordance with, [ITM 803](#) . – Contractor Quality Control Plan for HMA Pavement. The QCP is to be submitted to the Architect/Engineer prior to commencing HMA paving operations.

Note: If an agency is obtaining mix from an asphalt mix producer, but placing it themselves, then the QCP for placement is not applicable. There may also be other cases where the QCP may not serve a practical need and not applicable and could be waived. A time line for the QCP submittal may be included. 5 work days is recommended as a reasonable time.

402.03

This section provides that the materials used in asphalt mixes (PG Binder and aggregates) meet INDOT quality standards and establishes quality control procedures for the suppliers.

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Asphalt Materials,

All PG binders (asphalt cements) used in asphalt mixes must be supplied according to the Binder Supplier Certification Program [ITM 581](#)

Typical PG Binders in Indiana are tabulated below

[Sec 902](#)

PG Grade	Typical Use(s)	PG Grade	Typical Use(s)
64-22	The standard grade for most highway use / mixtures may contain up to 25% binder replacement using RAP/RAS	58-28	Softer and the default grade when 64-22 is specified and mixture contains greater than 25% binder replacement using RAP /RAS
70-22	High volume, heavy and slow moving traffic/ Stiffer than 64-22/ may be modified/ / mixtures may contain up to 25% binder replacement from RAP/RAS Open graded mixtures when fibers are used	64-28	Softer than 70-22 and default grade when 70-22 is specified and mixture contains greater than 25% binder replacement from RAP /RAS
76-22	High volume, heavy and slow moving traffic / stiffer than 70-22/ Modified / mixtures may contain up to 25% binder replacement from RAP/RAS Open graded mixtures when fibers are not used	70-28	Softer than 76-22 and default grade when 76-22 is specified and mixture contains greater than 25% binder replacement from RAP /RAS

PG64-22 is normally selected, except for high volume, heavy traffic or open graded mixtures, used in drainage layers. PG58-28 is, by default, selected when the liquid asphalt in the recycled material replaces more than 25% of the total liquid asphalt in the asphalt mixture when PG64-22 is specified.

Aggregates

All Aggregates used in asphalt paving mixtures must be supplied by an INDOT Certified Aggregate Producer [CAPP List](#)

[ITM 211- Certified Aggregate Producer Program](#)

Coarse Aggregates (sizes greater than about #4 sieve“)

[Sec 904](#)

Fine Aggregates (sizes smaller than #4 sieve)

[Sec 904](#)

402.04 Design Mix Formula

This section provides the reference to the methods to prepare and submit a laboratory job mix formula (JMF) or design mix formula (DMF) and the selection of the specific type(s) of mix required.

INDOT defines a DMF as a laboratory mix design. A DMF becomes a job mix formula (JMF) after it is produced through a hot mix plant and has been adjusted to meet the mix design requirements. For the purposes of this document the term job mix formula (JMF) will be used for both cases.

Three items must be selected by the agency to specify the appropriate mix.

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1. Type (called "Category" in Section 401) - Related to the expected traffic volume (A, B, or C)
2. Layer - base, intermediate or surface
3. Nominal Maximum Aggregate Size (NMAS) - related to the compacted layer thickness the agency selects. (the NMAS is normally shown on the typical pavement cross section or stated in the specification)

For example: If the agency wants to specify a typical 1.5" overlay of surface on a low volume road, (less than 4000 AADT) it would be specified as: HMA Surface, Type A, 9.5 mm

Material Adjustment Factor (MAF) is mentioned in this section and is a factor applied to certain mixtures that are either heavier or lighter per unit weight than most mixtures containing mostly limestone or natural aggregates. Examples may be mixtures containing blast furnace slag or steel furnace slag. The MAF is applied and affects the average yield of the pavement (lbs/sys) and final payment amount. We recommend MAF not to apply to non-INDOT projects.

Below is a table to assist in selecting the appropriate Type, Layer and NMAS. This guide specifically does not address high volume pavement selection. (Greater than 10 million ESAL)

1.Mixture Type	Type A *	Type B*	Type C*
Design ESAL	200,000	2,000,000	9,000,000
AADT	<4000	4000- 15,000	15,000-30,000
AADTT (Trucks)	<50	50-1700	>1700
2. Layer	3. NMAS	Maximum size of aggregate in mixture	Recommended Compacted Thickness Range
Surface**	4.75mm (#4 sieve) 9.5 mm (3/8") 12.5 mm (1/2")	3/8" 1/2" 3/4"	3/4" -1-1/2" 1"-2" 1-7/8"-3.0"
Intermediate	9.5 mm (3/8") 12.5mm (1/2") 19.0 mm (3/4") 25.0 mm (1.0")	1/2" 3/4" 1.0" 1-1/2"	1.0"-2.0" 1 7/8"-3.0" 2.0"-4.0" 3.0"-6.0"
Base	19.0 mm (3/4") 25.0 mm (1.0")	1.0" 1-1/2"	2.0"-4.0" 3.0"-6.0"
PG Binder			
-Surface	64-22	64-22	70-22
-Base & Intermediate	64-22	64-22	64-22

*A higher category mix is allowed to be substituted for a lower category application if the contractor so elects. The substitution will be at no additional cost to the agency.

****NOTE:** Due to skid resistance qualities, INDOT specifies that Type C surface mixes contain certain types of coarse aggregates. Those include air cooled blast furnace slag, steel furnace slag, dolomite or polished resistant aggregate (PRA). In some locations these aggregates are not locally available and must be hauled some distance at an additional cost. For traffic speeds of 45 mph or less the additional cost may not be warranted.

This section also allows the production of all the above Mixture Types by using a water-injection foaming device. It requires the minimum plant discharge temperature be stated on the JMF

Note: Other additives to produce Warm mix Asphalt (WMA) may be allowed by the specifying agency, but should be per the manufacturer's recommendations. Generally warm mix additives increase the cost of HMA whereas foaming devices do not.

402.05 Volumetric Mix Design

This section defines the reference to procedures and specification for creating a laboratory prepared Job Mix Formula (JMF). It requires the JMF to be performed by an [INDOT Approved Mix Design Laboratory](#)

This section allows the change in binder source (supplier) and binder grade as long as it meets the minimum for the mixture Type required.

This section also defines the Material Adjustment Factor (MAF) which compensates for steel slag aggregate that is heavier or blast furnace slag that is lighter than typical aggregates. Application of this provision directs adjustments to design lay rates and payment quantities.

Insert "The MAF in Section 402.05 shall not apply"

402.06 Job Mix Formula

This section requires the JMF to be submitted and approved by the agency prior to commencing paving. Local agency should give adequate lead time to the producer for submitting the JMF. After approval, any change in the source or type of aggregate requires a new JMF.

402.07 Mix Criteria

Defines certain asphalt paving mixtures for miscellaneous non-mainline application such as:

1. Rumble strips
2. Wedge and level
3. Temporary mixtures
4. HMA curbing

402.08 Recycled Materials

This Section defines Reclaimed Asphalt Pavement (RAP), Recycled Asphalt Shingles (RAS), and the appropriate methods of handling each. It also defines maximum allowable recycled materials in various mix types. It also defines the appropriate method to calculate the percentage of RAP and/or RAS allowed as % Binder Replacement. That is, the % of recycled materials is calculated based on per cent of asphalt binder contained in each of the respective materials compared to the total per cent of asphalt binder in the mix.

The table below shows the maximum allowable RAP/RAS binder replacement.

Recycled Materials (RAP/RAS % based on Binder Replacement %)

Asphalt Paving Mixtures utilizing RAP or RAS or a blend of RAP and RAS		
Maximum Binder Replacement, %		
Mixture Category	Base and Intermediate	Surface
	Dense Graded	Dense Graded

	25.0 mm	19.0 mm	12.5 mm	9.5 mm	12.5 mm	9.5 mm	4.75 mm
A	40.0*				40.0*		
B	40.0*				40.0*		
C	40.0*				25.0		

*RAS materials may contribute a maximum of 25% by weight of the total binder content for any Asphalt Paving mixture.

This section also states that the PG grade specified does not change when up to 25% Binder Replacement comes from RAP or RAS. When more than 25% of the total binder comes from RAP or RAS the PG grade used must be one grade softer for both the high temperature and the low temperature PG binder grade. For example, if more than 25% RAP /RAS binder is in the mix then PG58-28 is to be used in place of PG64-22 and PG 64-28 is to be used in place of PG70-22. This is to compensate for the stiffness of the additional amount of aged binder in the RAP/RAS.

Note; Mix designs containing RAP/ RAS are prepared in a lab using the per cents of RAP/RAS materials intended to be used in production and meet the same mix design criteria as a mix design prepared using all virgin materials.

402.09 Acceptance of Mixtures

This defines the acceptance method. The frequency of sampling is defined by the [INDOT Frequency Manual](#) and the minimum frequency of quality control sampling and testing is shown in the table below. A Type D Certification, [Sec 916\(d\)](#) prepared and signed by the producer includes the test results for binder content and air voids from his most recent quality control tests of that specific mix.. These quality control samples are normally taken from trucks at the plant or as stated in the contractor's Quality Control Plan. Type D Certificates normally are supplied to the agency on a daily basis. Acceptance tolerances are also included in this section.

Mixture	Minimum Quality Control Sampling and Test Frequency
Base and Intermediate	Within first 250 tons of production and then one per 1000 ton thereafter
Surface	Within first 250 tons of production and then one per 600 ton thereafter

INDOT normally pays for asphalt mix only on the basis of tons.. This section also contains a couple of lines that address the costs of removing and replacing soft yielding areas. The contractor should not be responsible for the stability of the surfaces to be overlaid unless he constructed them or the unsuitability is addressed as part of the contract.

INDOT normally utilizes this 402 section where smaller quantities are used or where constructability is not the same as mainline paving. However INDOT also has the sampling and testing infrastructures system in place to do independent random sampling and testing for acceptance. Use of Section 402 and utilizing the Type D Certification an agency can take advantage of all the quality control system that INDOT uses in their construction.

PART B - CONSTRUCTION REQUIREMENTS
(Transporting, lay down and compaction)

402.10 General

References the equipment [Section 409](#) and specified Modification Certificate of Compliance required for a paver [Sec 401.10](#)

Lists solvents that are not allowed to be used to clean tools

Lists visual deficiencies and corrective actions.

402.11 Preparation of Surfaces to be Overlaid

Defines good construction practices and cross references to the surfaces that paving will be placed upon. Includes references to;

Subgrade- [Sec 207](#)

Milled surfaces- [Sec 306](#)

Tack Coat- 406- [Sec 406](#)

Prime Coat-405- [Sec 405](#)

Note: prime coat is applied only to rubblized bases by current Specifications

402.12 Weather Limitations

This section places minimum ambient and surface temperature at which mixtures may be placed. It also allows an alternate procedure to place mixture below those specified when the contractor elects to perform additional in-place density tests to assure acceptable compaction. [Sec 402.16](#)

The minimum temperatures are summarized in the table below.

Lay Rate	Compacted thickness	Minimum Temperature
Less than 110 lb/sys	Less than one inch	60° F
110 lb /sys less than 220 lb/sys	1.0 in. to less than 2 inches	45° F
220 lb/sys or more	2.0 or more inches	32° F
All		Not on Frozen Subgrade

402.13 Spreading and Finishing

This Section addresses allowable, required and limiting production activities and includes the following:

References the equipment section-409.03(c) for laydown equipment

Allows placement by other means when areas are inaccessible to laydown or other mechanical equipment

Limits minimum mix temperature at time of spreading (not more than 18° F below minimum mixing temperature shown on JMF)

This Section addresses restricts on the depth and paving sequences when paving adjacent two lane roads while under traffic. (These restrictions are for traffic safety)

Addresses the use of hydraulic and fixed extension used on a paver.

Requires the used of automatic paving equipment (i.e. a paver not a widener) when placing shoulders 8 ft. or more in width

Limits the maximum speed of a paver to 50 ft. per minute

Addresses the use of automatic slope and grade controls when paving

Restricts the compacted thickness placed to at least 2 times but not more than 4 times the maximum particle size (refer to the table in the [Design Mix Formula](#) section of Part A)

Allows the finished thicknesses of wedge and level to be 1.5 to 6 times the maximum particle size and allows feathering to be less than minimum thicknesses

Defines placement of rumble strips.

402.14 Joints

This Section describes the construction of longitudinal and transverse joints. Surface longitudinal joints are to be placed at lane lines.

Longitudinal joints below the surface are to be offset 6 inches from the previous layer and within 12 inches of the lane line.

Transverse joints are to be constructed by exposing a near vertical full depth face of the previous course

Allows feathering of a temporary Transverse joint

Note: The contractor's quality control plan should describe the details of how they will construct their joints.

402.15 Compaction

This section describes the equipment (types of rollers) and methods to use for compacting asphalt mixtures and joints. Section includes the table below. It also refers to allowable equipment in [Sec. 409.03](#). Discusses detrimental effects and allows reduction of the number of passes when distresses occur.

Rollers	Number of Roller Applications					
	Courses < 440 lb/sys (240 kg/m ²)				Courses > 440 lb/sys (240 kg/m ²)	
	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2
Three Wheel	2		4		4	
Pneumatic Tire	2	4			4	
Tandem	2	2	2		4	
Vibratory Roller				6		8
Oscillatory				6		

402.16 Low Temperature Compaction Requirements

This Section specifically describes the procedures to be used for density control when mixtures are placed below those listed in Sec. 402.12. The procedures require density testing which includes pavement coring and plate sampling by the contractor.

It allows visual acceptance if quantities placed are less than 100 ton per day.

Optional: Asphalt Pavement courses may be placed at lower temperatures if approved by the owner's representative.

402.17 Shoulder Corrugations

Refers to [Section 606](#)

402.18 Pavement Smoothness

Refers to [Section 401.18](#)

402.19 Method of Measurement

Defines asphalt mixtures to be measured by the ton and adjusted by the Material Adjustment Factor (MAF)

The local agency could select the following when specifying:

“The MAF in Section 402.05 shall not apply”

Some agencies specify the compacted thickness in inches rather than an application rate (lbs/sy) in typical pavement cross sections Pay on the basis of square yards. We do not recommend this practice.

402.20 Basis of Payment

Current INDOT Standard Specifications lists only three Pay Items for this section, however by adding asphalt paving items to this section the 402 section becomes applicable to mainline paving. For example, add:

Pay Item	Pay Unit
*HMA Surface, Type __, __mm	Ton
*HMA Intermediate, Type __, __mm	Ton
*HMA Base, Type __, __mm	Ton
*Mixture Type and NMAAS	

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