

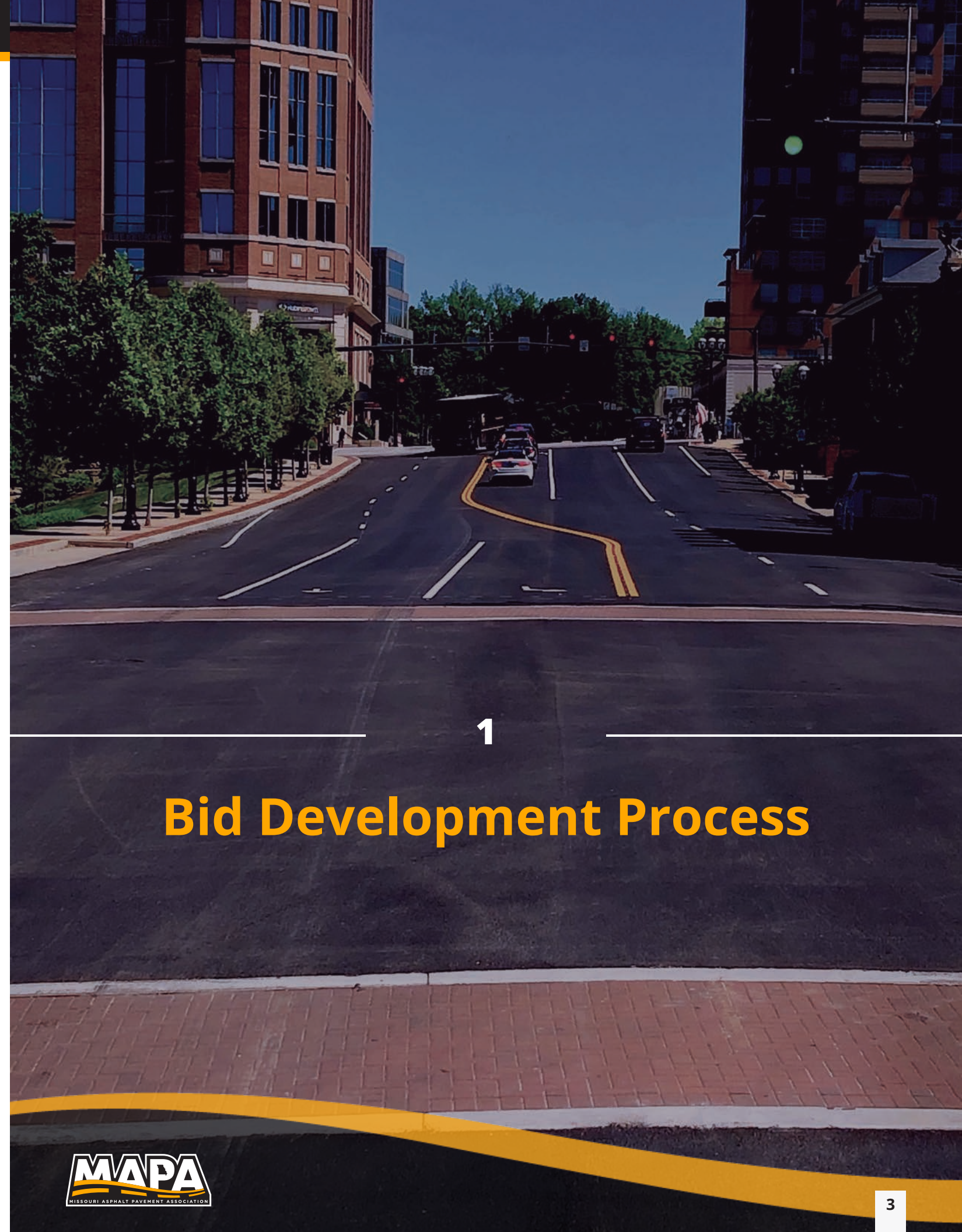


Asphalt Pavement Design & Construction Guide

A publication for owners, architects and engineers who design and construct asphalt pavements and parking lots.

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Bid Development Process

5 Key Components of a Bid Package

As an owner you want to be assured that you are getting the desired outcome when you seek bids for a pavement, parking lot, maintenance treat, etc. This can easily be accomplished by putting together a comprehensive bid package. This document is intended to provide guidance to develop a bidding process and specification for the owner.

The 5 key components of every bid package are:

1. Well Defined Scope of Work
2. Current Specifications
3. Accurate Plans
4. Established Budget
5. Itemized Proposal

1. Well Defined Scope of Work

When seeking bids for a project, a well-defined scope of work in the bid advertisement will attract bidders/contractors to supply a bid for the project.

Take for example the project scopes:

The Scope of Work includes an asphalt surface treatment.

vs

The Scope of Work includes cold milling 64,234 S.Y. of asphalt pavement and placing 10,280 tons of BP-2 at a compacted depth of 2 inches on Main Street.

The latter example is much more appealing for a contractor to look at as they can quickly determine if this is a scope of work they are suited to build.

2. Current Specifications

The use of current and local specifications is extremely important for several reasons. Asphalt is an engineered product with technology and design parameters constantly evolving. As technology evolves, design parameters mix designations change. Therefore, using the most current specifications is critical when specifying a pavement treatment.

It is also important to utilize local specifications and products to assure product availability. In the absence of having your own specifications, it is recommended to utilize the currently effective version of the Missouri Standard Specifications for Highway Construction.

3. Accurate Plans

Accurate and detailed plans help to assure the owner that they will get what is specified and reduces risk not only for the owner but also for the bidder. Reduced risk equals better pricing.

Consider the following plan detail:

2 inches asphalt mix vs 2 inches of compacted BP-1

Again, the more accurate and detailed the plans, the less room there is for interpretation by the bidder, which leads to less risk and accurate pricing.

4. Established Budget

As an owner it is important to know your budget and scope a project that you can afford to build. This can easily be achieved by estimating a project as the plans and specifications are developed. Working with local contractors can help you understand anticipated project costs.

A complete list of MAPA Contractor Members can be found at:

<https://moasphalt.org/members/>

5. Itemized Proposal

An itemized proposal is very similar to an accurate set of plans. It helps the bidder understand exactly what the owner is wanting.

Items of work should be broken out and specified in correct units. When items are lumped together, it increases risk on the part of the bidder. Also, during construction, it is much easier to administer a contract especially when changes in work happen in the field due to differing site conditions.

Itemized Bid Proposal Example

Description	UM	Units	Price	Total
Mobilization/Demobilization	LS			\$0.00
Maintenance Of Traffic	LS			\$0.00
Milling - Mainline	SY			\$0.00
Milling - Approaches	SY			\$0.00
Tack	GAL			\$0.00
BP-1	TON			\$0.00



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Designing Asphalt Pavements

New Construction

Design of the pavement structure should be performed by a knowledgeable pavement engineer or through the assistance of pavement design software such as PaveExpress®.

<https://pavexpress.com/>

Pavement Evaluation

Pavement maintenance and rehabilitation begins with evaluation of the road's condition. Matching the type of treatment to the roadway usage and condition are key to determining the most economically feasible treatment.

Evaluation includes consideration of geometry, surface condition and structural adequacy for current and future use as well as ensuring the pavement is adequate for equipment needed during proposed improvements.

- Geometry of the roadway will take into consideration the profile, crown, cross-slope and drainage.
- Profile correction may need to be implemented for excessive roughness, dips or bumps in the existing surface.
- Occasionally the crown of the roadway may need to be reestablished if the roadway has become troughed or the crown is excessive.
- Cold milling or leveling may need to be employed prior to the treatment to maintain curb reveals, match gutter lines, correct rutting or otherwise maintain a drainable cross-slope.
- Maintaining drainage of the pavement is one of the most important aspects of producing a long-lasting pavement. Ensure that the pavement and subgrade can drain to pavement drainage features.

Surface Condition Provides Clues

Surface condition is not only an indicator of existing surface but provides clues as to the adequacy of underlying materials that may need addressing. A visual rating guide such as the Paser Manual for Asphalt Roads (<https://www.apa-mi.org/docs/Asphalt-PASERManual.pdf>) may be used. This can be followed up by coring and other forensic methods to determine the full extent of pavement deterioration.

Scope of Work

The scope of work should be clearly defined in the contract documents and plans.

Scope of Work Punch List

- A description of the work to be performed
- Terminal points and special conditions or instructions to the contractor.
- Transition into abutting side roads and terminal points with cold milled butt cuts.
- Geometry of the roadway will take into consideration the profile, crown, cross-slope and drainage.
- Where shoulders do not exist, gutter line milling for shoulder taper to the center of the roadway or edge of shoulder to avoid thin areas at the center of the mat that are susceptible to low density and cracking.
- Consider spot patching for areas of high distress. This may be either partial or full depth repairs.

Utilities

Utilities can affect the final look and ride of a project. Time the project to be constructed after planned utility work on the roadway is completed.

Coordinate with the utility companies to avoid open cuts of the new project and allow time for trenches and pits to settle. When the surface is to be milled, consider lowering utility covers and appurtenances prior to the work and adjust to the finished surface after paving is completed.

Utility adjustments to be completed by the contractor should be described in a JSP and paid as a separate item from the paving.

Methods and Materials Not Covered by Specifications

Methods and materials not covered by the specifications should be contained in job special provisions (JSP) that detail the work. Use caution with JSP's that specify proprietary products and methods or a single source as they may limit competitive bidding or have unexpected costs associated with them.

Tack Coat Application

Aggregate base to be paved over should have a prime coat applied if the total asphalt thickness is less than 3-3/4 inches. Asphalt pavements or patching 4 inches or thicker do not require a prime coat. All existing surfaces to be overlaid should be tacked as shown in the table to the right.

Tack Coat Application Rates		
Surface Type	Target Rate Undiluted (gal/yd ²)	Target Rate 20% Diluted (gal/yd ²)
New Asphalt	0.05	0.06
Existing or Concrete	0.08	0.10
Cold Milled	0.10	0.13

To control tracking of tack onto adjacent concrete streets or other unwanted locations, less-tracking tack or the use of a spraypaver may be specified.

Mix Types

Mix Type Guidance

All mixes follow current MoDOT Specifications for Sections 401, 402 and 403.

Corridor Designation	Traffic	Layer Type	Recommended Mix	Asphalt Binder
Maintenance		Surface/Wedge	SL	PG 64-22
Residential		Surface	BP-2	PG 64-22
		Binder/Base	BB	PG 64-22
Collector	< 600 Trucks Daily	Surface	BP-1	PG 64-22
		Binder/Base	BB	PG 64-22
	> 600 Trucks Daily	Surface	SP125F	PG 64-22
		Binder/Base	SP190F/SP250F	PG 64-22
Arterial		Surface	SP125C	PG 64-22
		Binder/Base	SP190F/SP250F	PG 64-22

Mix Type Selection

- Superpave mixtures should be used sparingly even for urban settings.
- For Arterial Streets, the binder grades are recommended minimums and are not to be reduced. The binder grade may be bumped to a PG 64-22 Grade H or PG 64-22 Grade V, when deemed necessary, to accommodate actual or anticipated traffic conditions.
- Typically, the grade should be raised one increment (Grade H) when traffic speeds are expected to be in the range of 12 to 45 mph and raised two increments (Grade V) for extremely slow traffic of < 12 mph. Typical candidates for these grade raises are roadways with AADT greater than 3500 that are in a highly congested, urbanized area, have frequent stop and go traffic, or have steep grades with significantly slow traffic speeds.
- Before using any other grade of asphalt binder, consult MAPA member experts for proper use and liquid asphalt suppliers to determine product availability.
- If a higher-grade PG asphalt binder is warranted, it shall be used in the surface mixture and the first lift of the underlying mixture.

Surface Leveling

Surface Leveling may be a good choice for a maintenance treatment for a cost effective method to hold the roadway until more adequate funding is available. This mixture is also good for wedging prior to a chip seal or other substantial overlay.

Lift Thickness

The above minimum lift thicknesses are recommended to ensure adequate field density can be achieved and a quality product can be provided. The minimum lift thickness does not account for surface irregularities in the roadway. Additional asphalt quantities of 5 to 10% should be included with single lift asphalt overlays to account for the surface irregularities. The additional asphalt quantities added should be in accordance with the average rutting depth measurements from the roadway.

Minimum Lift Thickness - Inches							
SL	BP-2	BP-1	Bit. Base	SP095	SP125	SP190	SP250
1.0	1.5	1.75	3.0	1.5	2	2.25	3.0

Project Cost

Asphalt Index

Utilizing an asphalt index can provide significant advantages for owners involved in asphalt paving projects.

By incorporating an asphalt index into contracts, owners can foster a more predictable and equitable bidding environment.

- The asphalt index acts as a tool to adjust for fluctuations in the price of asphalt cement, a key component of asphalt.
- It allows contracts to reflect changes in market conditions, reducing the financial risks associated with price volatility.
- This helps in maintaining project budgets and schedules, crucial to the successful completion of projects.
- It encourages fair competition among contractors and stability for smaller contractors who may be more susceptible to price changes.

A Pricing Mechanism

MoDOT's asphalt index serves as a pricing mechanism within construction contracts. It tracks the fluctuations in asphalt costs over time, providing a benchmark for pricing adjustments. Contractors have the option to include the index in their bids or contracts

Easily Adjust based on Changes in Asphalt Costs

When the index is utilized, it allows for adjustments in pricing based on changes in asphalt costs. This helps in managing cost fluctuations over the course of the project. Contractors can adjust their prices according to the variations in the index, ensuring that their bids accurately reflect current market conditions for asphalt.

Promotes Fairness & Transparency

MoDOT's asphalt index essentially offers a mechanism for incorporating market-driven changes in asphalt prices into construction contracts, promoting fairness, transparency, and cost predictability throughout the project duration. Contract Language for using an optional asphalt index can be found in the Sample Bidding Documents.

Payment

Payment Guidelines

- Payment for **tack coat** and **prime coat** should be by the gallon. When diluted emulsion is required, the quantities will be reduced to the undiluted rate for payment.
- Payment for **asphaltic concrete** by the square yard should only be used for full depth asphaltic concrete pavements. All other payments for asphaltic concrete should be by the ton.
- **Patching** should be paid separately from mainline mixture.
- For **preliminary design**, estimate factors may be used to compute quantities for bases, flexible type pavements.

Estimate Factors Ton/yd ³	
BP-2	1.934
BP-1	1.948
Bit. Base	1.943
SP095	1.913
SP125	1.927
SP190	1.940
SP250	1.946

Based on statewide averages; local estimates can be achieved by using the average G_{mm} of local mixtures:
 $G_{mm} \times 0.783$.

The following formula can be used to estimate the number of tons required to build a project:

Project Tonnage Estimate = ((L x W x (T÷12)) ÷ 27) x EF

L = Length in Feet **W** = Width in Feet **T** = Thickness in Inches **EF** = Estimate Factor from table above

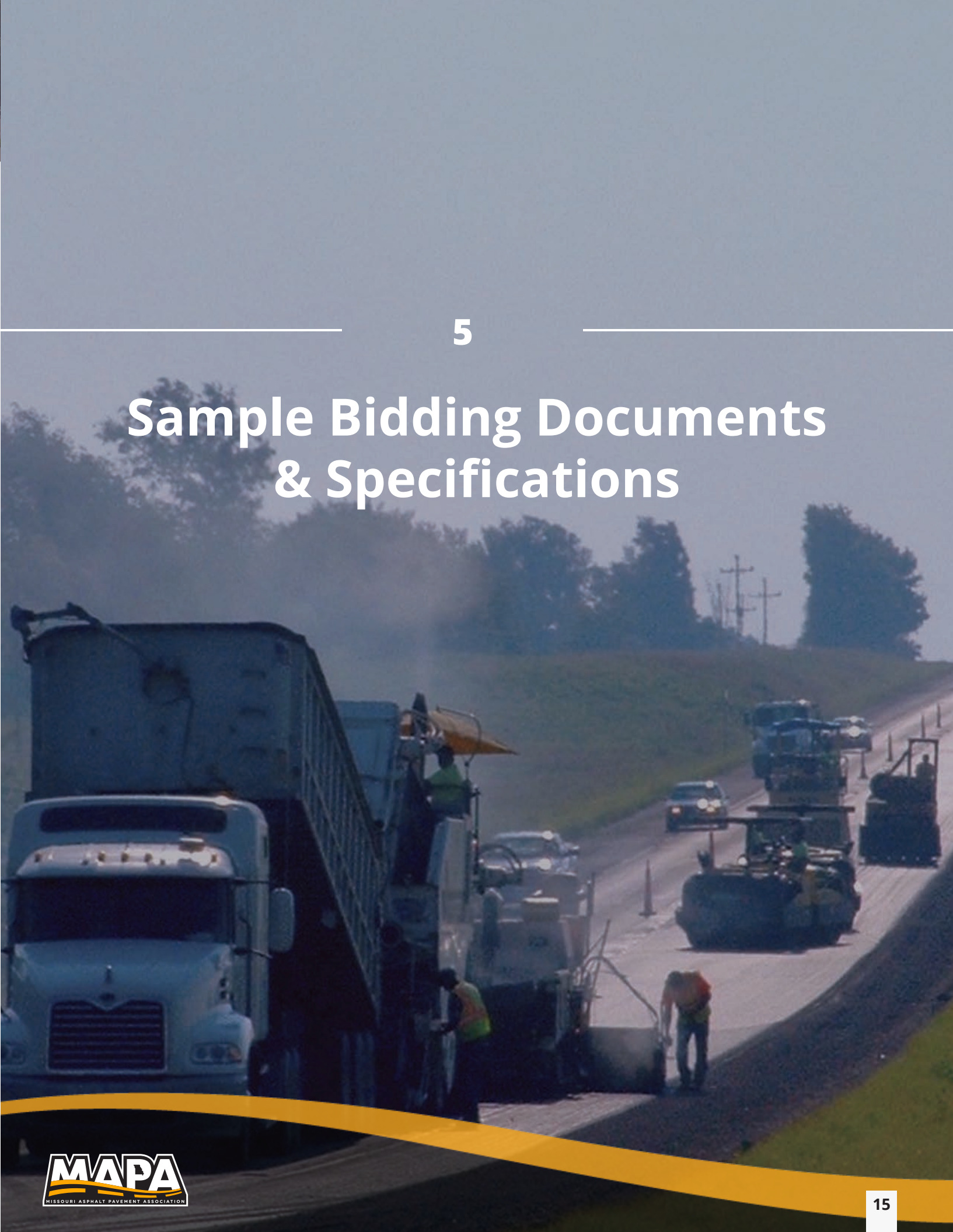
Value Engineering

Being open to Value Engineering proposals by the contractor is one way to reduce project costs after award of the project.

The contractor may have a unique point of view on staging or construction methods that can save either time or money. These need to be accompanied by detailed designs and cost breakdowns prior to acceptance of the proposal. Cost savings can also be realized by talking to several contractors experienced in paving

and road construction prior to finalizing plans to get a new perspective on the work. Value Engineering cannot be prearranged prior to the bid. If an idea comes to light prior to the bid and all parties agree, an addendum to the contract can be issued so that all bidders are bidding on the same work.

Sample Bidding Documents & Specifications



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1.0 Advertisement for Bids

- 1.1 The (insert entity seeking procurement) will receive bids for (insert project name), (insert entity), all in accordance with the contract documents and specifications. Bids will be received (insert bid date and time, location of bid opening). Bids will be publicly opened at (insert bid time), at (insert location of bid opening). Bids received after that time will be returned unopened.
- 1.2 The work will consist of (insert scope of project).
- 1.3 Contract documents are on file and may be examined at (insert project viewing location) or may be purchased at (insert location plans can be purchased).
- 1.4 A pre-bid meeting will be held at (insert pre-bid meeting date and time, location of pre-bid opening).
- 1.5 All project questions shall be submitted (insert project contact information) by (insert last date to submit bid question prior to bid opening).

2.0 Introduction and General Conditions of Bidding

2.1 Inspection of Plans, Specifications, and Site of Work

The bidder is required to carefully examine the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and contract forms before submitting a proposal.

2.2 Qualifications of Bidders

The (insert entity) may make such investigations as deemed necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to the (insert entity) all such information and data for this purpose as the (insert entity) may request. The (insert entity) reserves the right to reject any bid if the evidence submitted by the bidder or investigation of such bidder fails to satisfy the (insert entity) that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

2.3 Bid Security

Each bid must be accompanied by a certified check or bid bond made payable to (insert entity) for five percent (5%) of the amount of the bid. Bid securities will be returned after award of contract except to the successful bidder.

Should the successful bidder or bidders fail or refuse to execute the bond and the contract required within ten (10) days after he has received Notice of Acceptance of his bid, he shall forfeit to the (insert entity) as liquidated damages for such failure or refusal, the security deposited with his bid.

2.4 Preparation of Bids

Bid must be made upon prescribed forms attached at the back of these Specifications. Only sealed bids will be considered, all bids otherwise submitted will be rejected as irregular.

All blank spaces in the bid must be filled in and no change shall be made in the phraseology of the bid or addition to the items mentioned therein. Any conditions, limitations, or provisions attached to bids will render them informal and may be considered cause for their rejection.

2.5 Addendum

Addendums may be issued on this project at any time up to (insert number of days) prior to the bid date and time. Occasionally an addendum may contain information that could affect a contractor's bid. It shall be the responsibility of the contractor to verify if any addendum has been issued prior to submitting their bid. The (insert entity) assumes no liability if a contractor fails to incorporate addenda into their bid.

2.6 Submission of Bids

The Bid and the Bid Security guaranteeing the same shall be placed in a sealed opaque envelope and marked with the project name, project number, and the bidder's name and address

2.7 Withdrawal of Bids

If a bidder wishes to withdraw his bid, he may do so before the time fixed for the opening, without prejudice to himself.

2.8 Right to Reject Bids

The (insert entity) reserves the right to reject any or all bids, to waive any informality in the bids received, or to accept the bid or bids that in its judgment will be for the best interest of the (insert entity).

2.9 Award of Contract

If within ten (10) days after he has received Notice of Acceptance of his bid, the successful bidder or bidders shall refuse or neglect to come to the office (insert entity) and to execute the Contract and to furnish the required Contractor's Bond, properly signed by the Contractor and the Surety or Sureties satisfactory to the (insert entity) as hereinafter provided, the bidder or bidders shall be deemed to be in default and shall forfeit the deposit.

2.10 Performance Bond

A Performance Bond in an amount equivalent to one hundred percent (100%) of the Contract price, must be furnished and executed by the successful bidder or bidders, this bond to be in the form contained in this Contract.

The Surety shall be a corporate Surety Company or companies of recognized standing licensed to do business in the state of Missouri and acceptable to the (insert entity).

2.11 Insurance

The Contractor shall be required to provide the (insert entity) with a "Certificate of Insurance."

2.12 Prevailing Wage Law

(Insert language about prevailing wage is required)

2.13 Notice to Proceed

The contractor's notice to proceed for each road will be as follows (insert date of notice to proceed)

2.14 Work Schedule

To ensure that the work will proceed continuously through the succeeding operations to its completion with the least possible interference to traffic and inconvenience to the public, the Contractor shall submit for approval a complete schedule of his proposed construction procedure, stating the sequence in which various operations of work are to be performed. The Contractor may not change the work sequence without the prior approval of the Engineer.

2.15 Contract Time

This contract shall be a completion date contract. The contract shall be completed by no later than (insert completion date)

2.16 Liquidated Damages

Liquidated damages shall be assessed at the rate of (insert liquidate damage dollar amount) per calendar day until the project is complete, should the project not be completed within the specified time.

2.17 DBE Participation

(Insert language about DBE participation if required)

2.18 Asphalt Index

ACCEPTANCE FOR PROVISION FOR ASPHALT CEMENT PRICE INDEX: Bidders have the option to accept the provision for Asphalt Cement Price Index in accordance with Sec 4.3.7. The bidder must mark the box below if they choose to accept the provision. No price adjustments will be made, due to asphalt price changes, for bidders who do not accept this provision.

☐ **Asphalt Cement Index**

3.0 Definitions

(Insert contract specific definitions as needed)

4.0 Primary Specifications

4.1 General Provisions

(Insert general contract provisions such as environmental regulations, training provision, etc.)

4.2 Job Special Provisions

(Insert items of special work or processes such as engineered crumb rubber, aramid reinforcing fibers, specialized tack coat, etc.)

4.3 Technical Specifications

4.3.1 Description:

This work shall consist of providing an asphalt mixture to be placed, spread and compacted in one or more courses on a prepared base or underlying course as shown on the plans or as directed by the engineer. The contractor shall be responsible for QC of the asphalt

mixture, including the design, and control of the quality of the material incorporated into the project. The engineer will be responsible for QA, including testing, to assure the quality of the material incorporated into the project. All Section references are to the current addition of the Missouri Standard Specifications for Construction that coincides with the letting date of this project.

<https://www.modot.org/missouri-standard-specifications-highway-construction>

4.3.2 Materials

The asphalt mixture shall be as designated in the contract documents. BP and BB mixes shall be produced in accordance with Section 401, SL mixes shall be produced in accordance with Section 402 and Superpave mixes (SP) shall be produced in accordance Section 403.

The final in-place grade of the liquid binder shall be in accordance with the contract documents. Provisions for utilizing softer grades of binder are outlined in Sections 401 and 403.

Mixtures approved by the engineer or MoDOT meeting the contract documents shall be used by the contractor. Mixtures for approval by the engineer shall be submitted 2 weeks before the start of paving. Prior to the start of construction, the contractor shall supply to the engineer the name of the asphalt mixture supplier and mix design that will be used for this project. No construction will proceed without prior approval of the mix design from the engineer.

Tack coat material requirements shall be in accordance with Section 407 and prime coat material requirements shall be in accordance with Section 408.

4.3.3 Construction Requirements

No mixture shall be placed on any wet or frozen surface. Asphalt will be laid during daylight hours only, unless approved by the engineer.

Existing surfaces to be overlaid shall have all loose material removed prior to the work. Areas requiring aggregate base shall be proof rolled with a loaded dump truck prior to placement of bituminous mixture.

A tack coat is required on all existing pavement and shoulder surfaces that will be overlaid with a bituminous mixture. All construction requirements of a tacked surface shall be in accordance with Sec 407 and specified herein. The surface to be tacked shall be cleaned

sufficiently to remove any loose coatings. Washing may be necessary for unusually dirty pavements. The tack coat shall be applied uniformly and shall completely cover the surface upon which the bituminous mixture is to be placed. Placement of a bituminous mixture shall not be placed upon a tacked surface that is not uniformly covered or surfaces that have experienced excessive loss of tack due to tracking.

Tack shall be applied uniformly with a pressure distributor or spray paver at the target rates indicated in the following table.

Tack Coat Application Rates		
Surface Type	Target Rate Undiluted (gal/yd ²)	Target Rate 20% Diluted (gal/yd ²)
New Asphalt	0.05	0.06
Existing or Concrete	0.08	0.10
Cold Milled	0.10	0.13

4.3.4 Upon approval by the engineer, the target application rate may be varied by +/- 0.02 gal/sy in the field, based upon the existing pavement condition. The tack coat material shall be heated at the time of application to a temperature in accordance with Sec 1015. When an asphalt emulsion is applied through a pressure distributor, the tack coat shall be properly set, and the tacked surface shall be clean of all dirt before the next course is placed.

Placement of the mixture shall be by a self-propelled paver with adequate controls that meet cross-slope, thickness and smoothness requirements of the plans and specifications. The thickness shown on the plans is the compacted thickness. Rollers shall be of sufficient size and number to compact the mixture to the required density. Handwork areas inaccessible to rollers shall be compacted with a heated mechanical compactor or hand-tamper.

Repair of damage to any driveways or side streets caused by the contractor shall be made at the discretion of the engineer and at the contractor's expense and shall be considered included in the bid. The contractor shall use care, including restricting load size to prevent damage to the existing streets in this reconstruction work.

4.3.5 Pavement Repairs

This work shall consist of providing and installing partial or full depth asphalt repairs where existing pavement is to be removed and replaced, as required in the contract documents.

Pavement repair includes all the following items, consolidated into one payment item:

- Full depth sawcut (perimeter of the removal limit)
- Pavement removals (including excavation and disposal)
- Subgrade compaction (613-10.12)
- Placement of the aggregate base rock as needed.
- Placement of the tack or prime coat
- Placement and compaction of either BP-1 or Bituminous Base

Full width, transition butt joint and edge line milling: This work shall consist of full-width, transition butt joint and edge line milling of asphaltic concrete. The milling operation will not be performed more than one day prior to the start of paving. Butt joints shall have a depth specified and transition to zero inches at a distance of fifteen feet. Gutter line milling shall begin at the centerline or edge of travelway from the specified depth to zero inches. On streets with a gutter line mill, the thickness of the asphalt overlay at the edge of the mill transition (seven feet off of the gutter line) will generally be less than the thickness specified in the contract documents. This should be taken into account at the time of bid. The contractor is responsible for the proper disposal of all material from the milling operation. All work associated with milling shall conform to Section 622.

4.3.6 Testing Requirements

This work shall consist of material and data collection necessary to test and verify compliance that the requisite design parameters and minimum standards have been met, as noted in these specifications.

The contractor shall maintain equipment and qualified personnel to perform QC field inspection, sampling and testing in accordance with applicable portions of Section 403. A proposed third party for dispute resolution shall be included with the mix design submittal.

The engineer will be responsible for Quality (QA), including testing, to assure the quality of the material incorporated into the project.

The contractor shall randomly test the mixture within the following frequencies. The gradation and the asphalt content shall be determined at least once every 1,000 tons of production or a minimum of once per day. QC tests on Superpave mixtures for VMA, Air Voids and Asphalt Content shall be performed in accordance with the small quantity

specification as outlined in Section 403 of the Missouri Standard Specifications for Highway Construction and at a frequency of no less than one per day if production does not exceed 750 tons and at a frequency of no less than two per day if production exceeds 750 tons. Independent or retained sample QA tests shall be performed at least once per 1500 tons, as indicated. Deleterious content of the aggregate shall be tested at least once per project. At the engineer's discretion, testing may be waived when production does not exceed 200 tons per day and the contractor shall certify the proper proportions of the approved mixture were used. The quantity of asphalt binder introduced into the mixer shall be the quantity specified in the job mix formula. No changes shall be made to the quantity of asphalt binder without written approval from the engineer. The quantity of asphalt binder determined by tests on the final mixture shall not vary by more than - 0.3 to + 0.5 percent from the job-mix formula. Gradation tolerances and deleterious content shall be within the limits outlined in Section 401.

During construction, the engineer will designate as many tests as necessary to ensure that the course is being constructed of proper thickness, composition and density. Density of the roadway shall be determined at a random location selected by the engineer for every 500 tons of production. The locations from each day's production will be averaged to determine acceptance. The maximum theoretical density shown on the job mix formula shall be used for this determination. The compacted mixture shall have a minimum density of 92 percent of the theoretical maximum specific gravity. Density shall be determined by the direct transmission nuclear method in accordance with MoDOT Test Method TM 41, by electromagnetic gauge, ASTM D6938, or by gravimetric method, AASHTO T 166.

When AASHTO T 166 is used, cores shall be a minimum 4-inch diameter and taken the full depth of the layer to be tested. The contractor shall restore the surface from which samples have been taken immediately with the mixture under production or with a cold patch mixture acceptable to the engineer.

Smoothness of the final pavement surface shall be measured with a 10-foot straightedge. The straightedge path in the longitudinal direction for driving lanes will be located three feet from the outside edge and for shoulders will be in the center. Additional paths with suspect roughness may be selected at the engineer's discretion. Shoulders that are paved integrally with an adjacent driving lane will not require straightedging. Any variations in the longitudinal direction exceeding 1/4 inch in 10 feet on shoulders and 1/8 inch in 10 feet on all other pavements shall be marked for correction in a manner approved by the engineer. (For higher traffic volumes on high-speed roadways pavement smoothness may be specified in accordance with Section 610.)

4.3.7 Method of Measurement

The weight of asphalt mixture shall be measured to the nearest 0.1 ton or full depth pavement measured to the nearest square yard, complete in place, for the total quantity accepted.

Measurement of tack and prime liquid asphalt will be made to the nearest gallon in accordance with Section 1015. If water is added to asphalt emulsion, the quantity to be paid will be determined prior to the addition of water.

Measurement will be made to the nearest square yard of pavement repair. All items listed are considered incidental and included for pavement repair.

Final measurement of milling will not be required. The quantity accepted will be the plan quantity unless appreciable errors or quantities are added.

4.3.8 Basis of Payment

Accepted quantities of material incorporated into the work will be paid at the contract unit price for each of the pay items included in the contract.

4.3.9 Price Adjustment for Asphalt Cement

4.3.8.1 Asphalt Cement Price Index.

Adjustments will be made to the payments due the Contractor for any plant mix bituminous base, plant mix bituminous pavement, plant mix bituminous surface leveling, asphaltic concrete pavement and ultrathin bonded asphalt wearing surface that contains performance graded (PG) asphalt binder when it has been determined that the Monthly Asphalt Index for the month prior to placement of the asphalt mixture has fluctuated from the Monthly Asphalt Index for the month the project was let. The Monthly Asphalt Index shall be established for each calendar month as the average of the midpoint selling prices of PG64-22 for St. Louis and Kansas City, Missouri areas, as published by Poten and Partners Inc. in the Asphalt Weekly Monitor®, on the first Monday preceding the date of the normal monthly MoDOT letting. For months when there is no normal monthly letting, the published price on the third Monday of that month shall be used for the Monthly Asphalt Index. The asphalt base index shall be the Monthly Asphalt Index for the month of the bid opening.

4.3.8.1.1 The price adjustment will be applied to the actual amount of virgin PG asphalt binder used by the Contractor for all asphalt items specified in Sec 4.3.7.1. For asphalt mixtures that are paid for by the square yard, the price adjustments will be made for applicable equivalent tons, as calculated by the engineer, based upon the plan square yard quantity and thickness converted to tons, excluding the 1:1 wedge. The percentage of virgin PG asphalt binder as shown in the job mix formula, will be the basis for price adjustments for any asphalt mix type placed on the project. The effective asphalt binder obtained from the use of Recycled Asphalt Pavement (RAP) and/or Recycled Asphalt Shingles (RAS) will not be eligible for adjustment. The Monthly Asphalt Index for PG64-22 will be applied to the asphalt mix for mixes using any PG asphalt binder.

4.3.8.1.2 Price Adjustment Calculated

To determine the price adjustment for any asphalt mix specified in this provision, the following formula will be used.

$$A = (B \times C / 100) \times (D - E)$$

Where:

A = Dollar value adjustment for mix placed during the payment estimate period

B = Tons of asphalt mixture placed during the payment estimate period

C = Percent of virgin PG asphalt binder as listed in the job mix formula in use

D = The Monthly Asphalt Index for the month prior to the month the asphalt mix was placed

E = The asphalt base index = the Monthly Asphalt Index for the month the project was let

4.3.8.1.3 The engineer will apply the price adjustments, as determined by the price adjustment calculation established herein, for each payment estimate period in which asphalt is placed. For asphalt placed after the contract completion time limit, the “D” value used for the price adjustment calculated shall be either the last “D” value prior to the date that contract time was exceeded, or the current monthly “D” value, whichever is lower.

4.3.8.1.4 Optional

This provision is optional. If the bidder wishes to be bound by this provision, the bidder shall execute the acceptance form in the below. Failure by the bidder to execute the acceptance form will be interpreted to mean election to not participate in the Asphalt Cement Price Index. If the Asphalt Cement Price Index is accepted, PG asphalt binder for the project will not be eligible for a material allowance as described in Sec 4.3.7.

Itemized Proposal

EXAMPLE BID PROPOSAL/FORM

Description	UM	Units	Price	Total
Mobilization/Demobilization	LS			\$0.00
Maintenance Of Traffic	LS			\$0.00
Milling - Mainline	SY			\$0.00
Milling - Approaches	SY			\$0.00
Tack	GAL			\$0.00
BP-1	TON			\$0.00
BP-2	TON			\$0.00
BP-3	TON			\$0.00
BB	TON			\$0.00
SP125C	TON			\$0.00
SP125F	TON			\$0.00
SP190C	TON			\$0.00
SP190F	TON			\$0.00
SP250C	TON			\$0.00
SP250F	TON			\$0.00
Type 1 Aggregate Base	SY			\$0.00
Type 5 Aggregate Base	SY			\$0.00
White Edge Line, Paint	LF			\$0.00
Solid Yellow Line, Paint	LF			\$0.00
Broken Yellow Line, Paint	LF			\$0.00
Pavement Marking Arrows, Paint	EACH			\$0.00
Pavement Marking Words, Paint	EACH			\$0.00
Stop Bars, Paint	LF			\$0.00
Adjust Castings to Grade	EACH			\$0.00
Adjust Water Valve Boxes to Grade	EACH			\$0.00
				\$0.00

