Purpose
To distribute specification language for HMA paving on bridge decks and to solicit feedback and input from the Regions and other stakeholders

Guidance
1. Standard Specifications Section 6-08 – Bituminous Surfacing on Structure Decks (Attachment 1). This is being proposed as a complete replacement for the existing Section 6-08 – Waterproofing. The existing Section 6-08 language is out-of-date and hasn't been used for many years.
3. Standard specification language changes in Section 9-20 addressing bridge deck repair materials (Attachment 1).
4. GSP language to be used when a Project Office completes surveying on Grade Controlled structures during the project development phase (Attachment 2).

Background
For many years now, WSDOT used special provisions to provide construction requirements for HMA paving on bridge decks. With a recent increase in the number of HMA paving projects on bridges, and in the interest of standardizing the bridge deck paving language, the State Construction Office, Bridge and Structures Office and State Materials Lab have developed standard specification language for this work.

The proposed language is similar to what has been used on recent bridge HMA paving projects. There have been changes to help tighten up the language, provide additional clarification where needed, and reduce unnecessary requirements. Major updates that have been incorporated include:

- Re-sequenced the specification to better align with the order of work.
- Simplified definitions and terminology where possible
- Realignment of some sections of the Specification. For example, HMA compaction and joint seals were both moved to Division 5 where the fit better with the other Division 5 work.
- In several areas, prescriptive construction requirements have been removed and replaced with a requirement to perform the work in accordance with the manufacturer’s recommendations.
- Moved material requirements for bridge deck repair material and waterproofing to Division 9

Additional changes have been made to the requirements for surveying HMA thickness on bridge decks. Some bridge decks are identified by the Bridge and Structures Office as being Grade Controlled. This designation may be made for a number of reasons including existing profile issues, no structural capacity for additional HMA weight, a need to change the cross-slope on the deck, etc. Structures identified as
being grade controlled require a survey of the existing HMA surfacing profile and survey of the existing deck profile prior to the start of construction. There are two ways that this can be accomplished:

1. Contractor completes surveying at the beginning of the project. The survey results are then submitted to the Bridge and Structures Office for review. If they identify a need for revisions to the HMA removal depth or final grade profile, the Project Office will work with the Contractor to incorporate these changes. The Specifications use this as the default method.

2. The Project Office completes the surveying work during project development. With this approach, the survey data can be used to develop contract requirements for HMA removal depth and final grade profile. This is the preferred approach because it eliminates the need to adjust removal depths or profiles under contract. If the surveying is done during project development, the GSP will be used to delete the requirements for Contractor surveying.

Resources
Primary points of contact for this effort included:
- Mike Bauer, Bridge and Structures Office
- Jeff Uhlmeyer, State Materials Lab
- Mark Gaines, State Construction Office

Additional resources include two other Construction Bulletins: HMA Paving on Bridge Decks: HMA Compaction and HMA Paving on Bridge Decks: Restrictions on Equipment Weight & Spacing.


Additional Information
The intent is to move these changes forward as part of the January 2017 Amendments to the Standard Specifications. Please direct any comments or questions you have these specifications to:
- Mark Gaines
  Lead Construction Engineer-Administration
  State Construction Office
  (360) 705-7827 (office)
Comments would be appreciated by close of business on Thursday, November 10th.
6-08  Bituminous Surfacing on Structure Decks

6-08.1 Description

This Work consists of removing and placing Hot Mix Asphalt (HMA) or Bituminous Surface Treatment (BST) directly on or over a Structure. This Work also includes performing concrete bridge deck repair, applying waterproofing membrane, and sealing paving joints.

6-08.2 Materials

Materials shall meet the requirements of the following sections.

- Bituminous Surface Treatment 5-02.2
- Hot Mix Asphalt 5-04.2
- Joint Sealants 9-04.2
- Closed Cell Foam Backer Road 9-04.2(3)A
- Waterproofing Membrane (Deck Seal) 9-11
- Bridge Deck Repair Material 9-20.5

6-08.3 Construction Requirements

6-08.3(1) Definitions

- Adjusted Removal Depth – the Bituminous Pavement removal depth specified by the Engineer to supersede the Design Removal Depth after review of the Contractor survey of the existing Bituminous Pavement grade profile.
- Bituminous Pavement – the surfacing material containing an asphalt binder.
- Design Removal Depth – the value shown in the "pavement schedule" or elsewhere in the Plans to indicate the design thickness of Bituminous Pavement to be removed.
- Final Grade Profile – the compacted finished grade surface of completed Bituminous Pavement consisting of a vertical profile and superelevation cross-slope, developed by the Engineer for Grade Controlled Structure Decks based on the Contractor survey.
- Grade Controlled – a Structure Deck requiring restriction of Bituminous Pavement work, including restriction of pavement removal methods and restriction of overlay pavement thicknesses.
- Structure Deck – the bridge deck (concrete or timber), bridge approach slab, top of concrete box culvert, or other concrete surfaces over or upon which existing Bituminous Pavement is removed and new Bituminous Pavement is applied.

6-08.3(2) Contractor Survey for Grade Controlled Structure Decks

Prior to removing existing Bituminous Pavement from a Grade Controlled Structure Deck, the Contractor shall complete a survey of the existing surface for use in establishing the existing cross section and grade profile elevations. When removal of Bituminous Pavement is to be achieved by rotary milling/planing, the Contractor’s survey shall also include the depths of the existing surfacing at each survey point.

The Contractor is responsible for all calculations, surveying, installation of control points, and measuring required for setting, maintaining and resetting equipment and materials necessary for the construction of the overlay to the Final Grade Profile.

6-08.3(2)A Survey Requirements

The Contractor shall establish at least two primary survey control points for controlling actual Bituminous Pavement removal depth and the Final Grade Profile. Horizontal control shall be by station and offset which shall be tied to either the Roadway centerline or the Structure centerline. Vertical control may be an assumed datum established by the Contractor.

Primary control points shall be described by station or milepost and offset on the baseline selected by the Contractor. The Contractor may expand the survey control information to include secondary horizontal and vertical control points as needed for the project.

Survey information collected shall include station or milepost, offset, and elevation for each lane line and curb line. Survey information shall be collected at even 20 foot station intervals, and along the centerline of each bridge expansion joint. The survey shall extend 300’-0” beyond the bridge back of pavement seat or end of Structure Deck. The survey information shall include the top of Bituminous Pavement elevation and, when rotary milling/planing equipment is used, the corresponding depth of Bituminous Pavement to the Structure Deck. The Contractor shall ensure a surveying accuracy to within ± 0.01 feet for vertical control and ± 0.2 feet for horizontal control.

Voids in HMA created by the Contractor’s Bituminous Pavement depth measurements shall be filled by material conforming to Section 9-20 or another material acceptable to the Engineer.

6-08.3(2)B Survey Submittal

The Contractor's survey records shall include descriptions of all survey control points including station/milepost, offset, and elevations of all secondary control points. The Contractor shall maintain survey records of sufficient detail to allow the survey to be reproduced. The Contractor shall submit a Type 2 Working Drawing consisting of the compiled survey records and information. Survey data shall be submitted as an electronic file in Microsoft Excel format.
6-08.3(2)/C Final Grade Profile and Adjusted Removal Depth

Based on the results of the survey, the Engineer may develop a Final Grade Profile and Adjusted Removal Depth. If they are developed, the Final Grade Profile and Adjusted Removal Depth will be provided to the Contractor within three working days after receiving the Contractor's survey information. When provided, the Adjusted Removal Depth supersedes the Design Removal Depth to become the Bituminous Pavement removal depth for that Structure Deck.

6-08.3(3) General Bituminous Pavement Removal Requirements

The Contractor shall remove Bituminous Pavement and associated deck repair material from Structure Decks to the horizontal limits shown in the Plans and to either the specified or adjusted Bituminous Pavement removal depth as applicable.

Removal of Bituminous Pavement within 12-inches of existing permanent features that limit the reach of the machine or the edge of the following items shall be by hand or by hand operated (nominal 30-pounds class) power tools: existing bridge expansion joint headers; steel expansion joint assemblies; concrete butt joints between back of pavement seats and bridge approach slabs, bridge drain assemblies; thre beam post steel anchorage assemblies fastened to the side or top of the Structure Deck.

When removing Bituminous Pavement with a planer, Section 5-04.3(14) shall apply. If the planer contacts the Structure Deck in excess of the specified planing depth tolerance, or contacts steel reinforcing bars at any time, the Contractor shall immediately cease planing operations and notify the Engineer. Planing operations shall not resume until completion of the appropriate adjustments to the planing machine and receiving the Engineer’s concurrence to resume.

6-08.3(4) Partial Depth Removal of Bituminous Pavement from Structure Decks

The depth of surfacing removal, as measured to the bottom of the lowest milling groove generated by the rotary milling/planing machine shall be +0.01, -0.02-feet of the specified or Adjusted Removal Depth as applicable.

6-08.3(5) Full Depth Removal of Bituminous Pavement from Structure Decks

6-08.3(5)/A Method of Removal

The Contractor shall perform full depth removal by a method that does not damage or remove the Structure Deck in excess of the specified Bituminous Pavement removal tolerance. The Contractor shall submit a Type 2 Working Drawing consisting of the proposed methods and equipment to be used for full depth removal.

6-08.3(5)/B Planer Requirements for Full Depth Removal

The final planed surface shall have a finished surface with a tolerance of + 0.01, -0.02 feet within the planed surface profile, as measured from a 10-foot straight edge. Multiple passes of planing to achieve smoothness will not be allowed.

In addition to Section 6-08.3(3), the planing equipment shall conform to the following additional requirements:

1. The cutting tooth spacing on the rotary milling head shall be less than or equal to 3/8 inch.
2. The rotary milling/planing machine shall have cutting teeth that leave a uniform plane surface at all times. All teeth on the mill head shall be kept at a maximum differential tolerance of 3/8-inch between the shortest and longest tooth, as measured by a straight edge placed the full width of the rotary milling head.
3. Cutting tips shall be replaced when 30 percent of the total length of the cutting tip material remains.

Prior to each day’s Bituminous Pavement removal operations, the Contractor shall confirm to the satisfaction of the Engineer that the rotary head cutting teeth are within the specified tolerances.

6-08.3(5)/C Structure Deck Cleanup after Bituminous Pavement Removal

Waterproofing membrane that is loose or otherwise not firmly bonded to the Structure Deck shall be removed as an incidental component of the Work of surfacing removal. Existing waterproofing membrane bonded to the Structure Deck need not be removed.

6-08.3(6) Repair of Damage due to Bituminous Pavement Removal Operations

All concrete bridge deck, pavement seat, and steel reinforcing bar damage due to the Contractor’s surfacing removal operations shall be repaired by the Contractor in accordance with Section 1-07.13, and as specified below.

Damaged concrete in excess of the specified Bituminous Pavement removal tolerance shall be repaired in accordance with Section 6-08.3(7), with the bridge deck repair material placed to the level of the surrounding bridge deck and parallel to the final grade paving profile.

Damaged steel reinforcing bar shall be repaired as follows:

1. Damage to steel reinforcing bar resulting in a section loss less than 20-percent of the bar with no damage to the surrounding concrete shall be left in place and shall be repaired by removing the concrete to a depth 3/4-inches around the top steel reinforcing bar and placing bridge deck repair material accepted by the Engineer to the level of the bridge deck and parallel to the final grade paving profile.
2. Damage to steel reinforcing bar resulting in a section loss of 20-percent or more in one location, bars partially or completely removed from the bridge deck, or where there is a lack of bond to the concrete, shall be repaired by removing the adjacent concrete and splicing a new bar of the same size. Concrete shall be removed to provide a 3/4-inch minimum clearance around the bars. The splice bars shall extend a minimum of 40 bar diameters beyond each end of the damage.
6-08.3(7) Concrete Deck Repair

This Work consists of repairing the concrete deck after Bituminous Pavement has been removed.

6-08.3(7)A Concrete Deck Preparation

The Contractor, with the Engineer, shall inspect the exposed concrete deck to establish the extent of bridge deck repair in accordance with Section 6-09.3(6), except item 4 in Section 6-09.3(6) does not apply. Areas of Structure Deck left with existing well bonded waterproof membrane after full depth Bituminous Pavement removal are exempt from this inspection requirement.

All loose and unsound concrete within the repair area shall be removed using jackhammers or chipping hammers no more forceful than the nominal 30 pounds class, or other mechanical means acceptable to the Engineer, and operated at angles less than 45 degrees as measured from the surface of the deck to the tool. If unsound concrete exists around the existing steel reinforcing bars, or if the bond between concrete and steel reinforcing bar is broken, the Contractor shall remove the concrete to provide a ¾ inch minimum clearance to the bar. The Contractor shall take care to prevent damage to the existing steel reinforcing bars and concrete to remain.

After removing sufficient concrete to establish the limits of the repair area, the Contractor shall make ¾ inch deep vertical saw cuts and maintain square edges at the boundaries of the repair area. The exposed steel reinforcing bars and concrete in the repair area shall be abrasive blasted and blown clean just prior to placing the bridge deck repair material.

6-08.3(7)B Ultra-Low Viscosity, Two-Part Liquid, Polyurethane-Hybrid Polymer Concrete

The ultra-low viscosity, two-part liquid, polyurethane-hybrid polymer concrete shall be mixed in accordance with the manufacturer’s recommendations.

Aggregate shall conform to the gradation limit requirements recommended by the manufacturer. The aggregate and the ultra-low viscosity, two-part liquid, polyurethane-hybrid polymer concrete shall be applied to the repair areas in accordance with the sequence and procedure recommended by the manufacturer.

All repairs shall be float finished flush with the surrounding surface within a tolerance of 1/8 inch of a straight edge placed across the full width and breadth of the repair area.

6-08.3(7)C Pre-Packaged Cement Based Repair Mortar

The Contractor shall mix the pre-packaged cement based repair mortar using equipment, materials and proportions, batch sizes, and process as recommended by the manufacturer.

All repairs shall be float finished flush with the surrounding surface within a tolerance of 1/8 inch of a straight edge placed across the full width and breadth of the repair area.

6-08.3(7)D Cure

All bridge deck repair areas shall be cured in accordance with the manufacturer's recommendations and attain a minimum compressive strength of 2,500 psi before allowing vehicular and foot traffic on the repair and placing waterproofing membrane on the bridge deck over the repair.

6-08.3(8) Waterproof Membrane for Structure Decks

This work consists of furnishing and placing a waterproof sheet membrane system over a prepared Structure Deck prior to placing an HMA overlay. The waterproof membrane system shall consist of a sheet membrane adhered to the Structure Deck with a primer.

The Contractor shall comply with all membrane manufacturer’s installation recommendations.

6-08.3(8)A Structure Deck Preparation

The Structure Deck and ambient air temperatures shall be above 50°F and the Structure Deck shall be surface-dry at the time of the application of the primer and membrane.

All areas of a Structure Deck that have fresh cast bridge deck concrete less than 28 days old (not including bridge deck repair concrete placed in accordance with Section 6-08.3(7)) shall cure for a period of time recommended by the membrane manufacturer, or as specified by the Engineer, before application of the membrane.

The entire Structure Deck and the sides of the curb and expansion joint headers to the height of the HMA overlay shall be free of all foreign material such as dirt, grease, etc. Prior to applying the primer or sheet membrane, all dust and loose material shall be removed from the Structure Deck with compressed air. All surface defects such as spalled areas, cracks, protrusions, holes, sharp edges, ridges, etc., and other surface imperfections greater than 1/4 inch in width shall be corrected prior to application of the membrane.

6-08.3(8)B Applying Primer

The primer shall be applied to the cleaned deck surfaces at the rate according to the procedure recommended by the membrane manufacturer. All surfaces to be covered by the membrane shall be thoroughly and uniformly coated with primer. Structure Deck areas left with existing well bonded waterproof membrane after bituminous surfacing removal shall receive an application of primer in accordance with the membrane manufacturer’s recommendations. Precautionary measures shall be taken to ensure that pools and thick layers of primer are not left on the deck surface. The membrane shall not be applied until the primer has cured or volatile material has substantially dissipated, in accordance with the membrane manufacturer’s
recommendations.

The primer and waterproof membrane shall extend from the bridge deck up onto the curb face and expansion joint header face the thickness of the HMA overlay. The membrane shall adhere to the vertical surface.

**6-08.3(8)/C Placing Waterproof Membrane**

Membrane application shall begin at the low point on the deck, and continue in a lapped shingle pattern. The overlap shall be a minimum of six inches or greater if recommended by the membrane manufacturer. Membrane seams shall be sealed as recommended by the membrane manufacturer. Hand rollers or similar tools shall be used on the applied membrane to assure firm and uniform contact with the primed surface.

The fabric shall be neatly cut and contoured at all expansion joints and drains. The cuts at bridge drains shall be two right angle cuts made to the inside diameter of the bridge deck drain outlet, after which the corners of the waterproof membrane shall be turned down into the drains and laid in a coating of primer.

**6-08.3(8)/D Membrane Repair and Protection**

The waterproof membrane will be visually inspected by the Engineer for uniformity, tears, punctures, bonding, bubbles, wrinkles, voids and other defects. All such deficiencies shall be repaired in accordance with the membrane manufacturer’s recommendations prior to placement of the HMA overlay.

The membrane material shall be protected from damage due to the paving operations in accordance with the membrane manufacturer’s recommendations. No traffic or equipment except that required for the actual waterproofing and paving operations will be permitted to travel or rest on the membrane until it is covered by the HMA overlay. The use of windrows is not allowed for laydown of HMA on a membrane.

Where waterproofing membrane is placed in stages or applied at different times, a strip of temporary paper shall be used to protect the membrane overlap from the HMA hand removal methods.

**6-08.3(9) Placing Bituminous Pavement on Structure Decks**

HMA overlay shall be applied on Grade Controlled Structure Decks using reference lines for vertical control in accordance with Section 5-04.3(3)/C.

The compacted elevation of the HMA overlay on Structure Decks shall be within ± 0.02 feet of the specified overlay thickness or Final Grade Profile as applicable. Deviations from the final grade paving profile in excess of the specified tolerance and areas of non-conforming surface smoothness shall be corrected in accordance with Section 5-04.3(13).

Final grade Roadway transitions to a Structure Deck with Bituminous Pavement shall not exceed a 0.20 percent change in grade in accordance with the bridge deck transition for HMA overlay Standard Plan, unless shown otherwise in the Plans.

Final grade compacted HMA elevations shall be higher than an adjacent concrete edge by ¼ inch ± 1/8 inch at all expansion joint headers and concrete butt joints as shown in the concrete to asphalt butt joint details of the bridge paving joint seals Standard Plan. This also applies to steel edges within the limits of the overlay such as bridge drain frames and steel joint riser bars at bridge expansion joints.

**6-08.3(9)/A Protection of Structure Attachments and Embedments**

The Contractor is responsible for protecting all Structure attachments and embedments from the application of BST and HMA.

Drainage inlets that are to remain open, and expansion joints, shall be cleaned out immediately after paving is completed. Materials passing through expansion joints shall be removed from the bridge within 10 working days.

All costs incurred by the Contractor in protective measures and clean up shall be included in the unit Contract prices for the associated Bid items of Work.

**6-08.3(10) HMA Compaction on Structure Decks**

Compaction of HMA on Structure Decks shall be in accordance with Section 5-04.3(10).

Work rejected in accordance with Section 5-04.3(11) shall include the materials, work, and incidentals to repair an existing waterproof membrane damaged by the removal of the rejected work.

**6-08.3(11) Paved Panel Joint Seals and HMA Sawcut and Seal**

Bridge paving joint seals shall be installed in accordance with Section 5-04.3(12)/B and the details shown in the Plans and Standard Plans

When concrete joints are exposed after removal of Bituminous Pavement, the joints shall be cleaned and sealed in accordance with Section 5-01.3(8) and the paved panel joint seal details of the bridge paving joint seals Standard Plan, including placement of the closed cell backer rod at the base of the cleaned joint. If waterproofing membrane is required, the membrane shall be slack or folded at the concrete joint to allow for Structure movements without stress to the membrane. After placement of the HMA overlay, the second phase of the paved panel joint seal shall be completed by sawing the HMA and sealing the sawn joint in accordance with Section 5-04.3(12)/B2.

**6-08.4 Measurement**

Removing existing Bituminous Pavement from Structure Decks will be measured by the square yard of Structure Deck
Bridge deck repair will be measured by the square foot surface area of deck concrete removed with the measurement taken at the plane of the top mat of steel reinforcing bars.

Waterproof membrane will be measured by the square yard surface area of Structure Deck and curb and header surface area covered by membrane.

6-08.5 Payment

Payment will be made in accordance with Section 1-04.1 for the following Bid items when included in the Proposal:

“Structure Surveying”, lump sum.

“Removing Existing Overlay From Bridge Deck___”, per square yard.

The unit Contract price per square yard for "Removing Existing Overlay From Bridge Deck___”, shall be full pay for performing the Work as specified for full removal of Bituminous Pavement on Structure Decks, including the removal of existing waterproof membrane and disposing of materials.

“Bridge Deck Repair Br. No.__”, per square foot.

The unit Contract price per square foot for "Bridge Deck Repair Br. No.__" shall be full pay for performing the Work as specified, including removing and disposing of the concrete within the repair area and furnishing, placing, finishing, and curing the repair concrete.

“Waterproof Membrane Br. No.__”, per square yard.

The unit Contract price per square yard for "Waterproof Membrane Br. No.__" shall be full pay for performing the Work as specified, including repairing any damaged or defective waterproofing membrane and repair of damaged HMA overlay.

9-11 Waterproof Membrane

9-11.1 Waterproof Membrane

Waterproof membrane shall be a sheet membrane conforming to ASTM D 6153 Type III, the puncture capacity specified below, and either the thin polymer sheet tensile stress or the geotextile and fabric grab tensile strength specified below:

<table>
<thead>
<tr>
<th>Performance Properties</th>
<th>Test Method</th>
<th>Specification Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Stress (for Thin Polymer Sheets)</td>
<td>ASTM D 882</td>
<td>75 pounds per inch min.</td>
</tr>
<tr>
<td>Grab Tensile Strength (for Geotextiles and Fabrics)</td>
<td>ASTM D 4632</td>
<td>200 pounds min.</td>
</tr>
<tr>
<td>Puncture Capacity (For Thin Polymer Sheets, Geotextiles and Fabrics)</td>
<td>ASTM E 154</td>
<td>200 pounds min.</td>
</tr>
</tbody>
</table>

Waterproofing membrane will be accepted based on a Manufacturer’s Certificate of Compliance with each lot of waterproof membrane.

9-11.2 Primer for Waterproof Membrane

The primer for the waterproof membrane shall be appropriate for bonding the sheet membrane to the bridge deck surface and shall be compatible with the membrane in accordance with the waterproof membrane manufacturer’s recommendations.
9-20  Concrete Patching Material, Grout, and Mortar

9-20.5 Bridge Deck Repair Material

Bridge deck repair material shall be either an ultra-low viscosity, two-part liquid, polyurethane-hybrid polymer concrete, or a pre-packaged cement based repair mortar, conforming to the following requirements:

2. Total soluble chloride ion content by mass of product shall conform to the limits specified in Section 6-02.3(2) for reinforced concrete.
3. Permeability of less than 2,000 coulombs at 56-days in accordance with AASHTO T 277.

If pre-packaged deck repair material does not include coarse aggregate, the Contractor shall extend the mix with coarse aggregate as recommended by the manufacturer.
Bituminous Surfacing on Structure Decks

6-08.GR6

Construction Requirements

6-08.3.GR6

Contractor Survey for Grade Controlled Structure Decks

6-08.3(2).GR6

Section 6-08.3(2) is supplemented with the following:

Must use once preceding the following:

6-08.3(2).INST1.GR6

(Contractor Structure Survey Not Applicable)

Use in projects where the Contracting Agency performs the Structure survey for Grade Controlled Structure Decks, and the Contract Plans were adjusted for Final Grade Profile and Adjusted Removal Depth as needed. The fill-in specifies the Bridge number(s) where the Contracting Agency is performing the survey.

(1 fill-in)

6-08.3(2).OPT1.FB6

Bituminous Surfacing on Structure Decks

6-08.3.GR6

Construction Requirements

6-08.3(2).GR6

Contractor Survey for Grade Controlled Structure Decks

6-08.3(2).INST1.GR6

Section 6-08.3(2) is supplemented with the following:

6-08.3(2).OPT1.FB6

(Contractor Structure Survey Not Applicable)

The Contractor survey requirements specified in this Section and associated Sections 6-08.3(2)A, 6-08.3(2)B and 6-08.3(2)C do not apply to the following Grade Controlled Structures in this Contract:

*** $$1$$ ***