2015 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

(Updated information can be found on the website: http://www.azmag.gov/Projects/Project.asp?CMSID=1055&CMSID2=7154)

CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE	
	CARRY FORWARD CASES FROM 2014						
14-03	Case 14-03: Updates to Guardrail Details. Revisions to Section 415 and/or inclusion of MCDOT guardrail details.	MCDOT	Bob Herz	01/08/2014		0 0 0	Yes No Abstain
14-06	Case 14-06: Revisions to Section 718 Preservative Seal for Asphalt Concrete.	Asphalt WG	Jeff Benedict	02/05/2014 05/29/2015		0 0 0	Yes No Abstain
14-12	Case 14-12: Proposed revisions to Sections 336, 321.10.3, 601.2.7 and Detail 200. Add pavement removal criteria to prevent full depth pavement cuts from being located within a lane wheel path and to prevent creation of narrow pavement edge strips.	MCDOT	Bob Herz	06/04/2014 05/18/2015		0 0 0	Yes No Abstain
14-17	Case 14-17: Create New Section 322 Asphalt Stamping. Provide specifications for materials and methods.	Materials WG	Brian Gallimore	07/09/2014 05/29/2015		0 0 0	Yes No Abstain
	NEW CASES FOR 2015						
15-01	**Case 15-01: Miscellaneous Corrections:** A. Add omitted text to Section 735.1. Text was approved by Case 14-07 and merged into Case 13-15. Both cases were approved in 2014. B. Revise “OA” to Quality Assurance and “OC” to Quality Control in Section 710. C. Update notes in Detail 225. D. Correct Title of Detail 270.	MCDOT	Bob Herz	02/05/2014 03/04/2015		0 0 0	Yes No Abstain
15-02	Case 15-02: Adjust Fence Requirements to Reference ASTM F1043. Revise Section 772, Table 771-1 and Detail 145.	MCDOT	Bob Herz	01/07/2015	03/04/2015	15 0 1	Yes No Abstain
15-03	Case 15-03: Revise Section 601.4.5 trench final backfill placement requirements.	MCDOT	Bob Herz	02/04/2015 05/21/2015		0 0 0	Yes No Abstain

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CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE	
15-04	Case 15-04: Revise Section 602 Trenchless Installation of Steel Casing. Update ASTM references for casing material and add minimum casing wall thickness.	Water/Sewer WG	Arvid Veidmark	02/04/2015 02/24/2015	04/08/2015	13 0 0	Yes No Abstain
15-05	Case 15-05: Proposed Revisions to Section 616 Reclaimed Water Line Construction and NEW Reclaimed Valve Box detail.	Chandler	Warren White	03/04/2015		0 0 0	Yes No Abstain
15-06	Case 15-06: Delete 744 ABS TRUSS PIPE AND FITTINGS.	MCDOT	Bob Herz	03/04/2015	05/06/2015	12 0 0	Yes No Abstain
15-07	Case 15-07: Revisions to Concrete Paver Standards for Non-Traveled Surfaces.	Chandler	Warren White	03/04/2015 05/21/2015		0 0 0	Yes No Abstain
15-08	Case 15-08: Revisions to clarify Table 710-4 to eliminate misinterpretation of Criteria 8.	MCDOT	Bob Herz	04/08/2015	06/03/2015	0 0 0	Yes No Abstain
15-09	Case 15-09: Miscellaneous revisions to Section 321: PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT.	Asphalt WG	Jeff Benedict	04/22/2015		0 0 0	Yes No Abstain
15-10	Case 15-10: Add subsection 321.10.5.3 “Rehabilitation Work” into the MAG Specifications.	Materials WG	Brain Gallimore	06/03/2015		0 0 0	Yes No Abstain
15-11	Case 15-11: Incorporate revisions to Section 717, “Mix Design Requirements” into the MAG Specifications.	Asphalt WG	Jeff Benedict	06/03/2015		0 0 0	Yes No Abstain
15-12	Case 15-12: New Section 608 HORIZONTAL DIRECTIONAL DRILLING.	Water/Sewer WG	Arvid Veidmark	06/03/2015		0 0 0	Yes No Abstain
15-13	Case 15-13: Add text to Section 725.6 to identify what to include in a concrete mix design submittal.	Concrete WG	Jeff Hearne	06/03/2015		0 0 0	Yes No Abstain

2015 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

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CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE	
15-14	Case 15-14: Revise Sections 321 and 325 to coordinate overlay work requirements.	MCDOT	Bob Herz	06/03/2015		0 0 0	Yes No Abstain

SECTION 718

PRESERVATIVE SEAL and SEALCOATING FOR ASPHALT CONCRETE

718.1 GENERAL

Asphalt Concrete preservative seal shall be one of the following types or equal, with typical application rates. Sealcoating material shall meet the requirements of section 718.3

TYPE A - Asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each supplier must submit a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements. They also must provide documentation of tests that determine the acceptable range of application of the product. Typical application rates are .07 to .18 gallons per square yard.

TYPE B - Petroleum Hydrocarbon emulsion. Applied at .05 to .20 gallons per square yard, diluted.

TYPE C - Tire modified surface sealer (TRMSS) or equal not diluted, and applied at a rate of .10 to .20 gallons per square yard.

TYPE D - Acrylic polymer modified emulsion. Diluted to the manufacture's recommendation and applied at a rate of .08 to .20 gallons per square yard.

TYPE E - Polymer, modified rejuvenating emulsion. (PMRE) Diluted to the manufacture's recommendation and applied at a rate of .08 to .20 gallons per square yard.

718.2 TEST METHODS AND REQUIREMENTS PRESERVATIVE SEAL

Preservative seal for asphalt concrete material, shall meet type A, B, C, D or E on Table 718-1 by certification from the manufacturer.

Tests shall be performed by AMRL accredited laboratory, accredited in the specified test being performed.

TABLE 718-1

PRESERVATIVE SEAL SPECIFICATIONS

Properties * (note 2)	Method	Type-A	Type-B	Type-C	Type-D	Type-E
Saybolt Viscosity @77°F (sfs)	ASTM D244	15-40	25-150	45-75 (KU)[1]	15-40	50-150
Sieve test %	ASTM D244	0.1 max	0.1 max	0.1 max	0.1 max	0.1 max
Storage Stability, 24 hours, %	ASTM D244					1.0 max
Settlement test, 5 days, %	ASTM D244		2.0 max		5.0 max	
Test on residue by:		**ASTM D244 Evaporation To** 138°C	**ASTM D244 Evaporation To** 138°C	**ASTM D244 Evaporation To** 138°C	**ASTM D244 Evaporation To** 138°C	**ASTM D244 Distillation To** 350°F
Residue Content, %	ASTM D244	60 min	62 min	30 min	53 min	65 min
Oil Distillate, % by volume	ASTM D244					0.5 max
Flash point [2] °F	ASTM D92	400°F	450°F	450°F	450°F	

Softening point, °F	ASTM D5			140 min.	130 min	
Viscosity [3], 60C, Poise	ASTM D2171					5000 max
Elastic Recovery [4], 10C, %	AASHTO T301					50 min
Ductility, 25C, 5 cm/min, cm	ASTM D113			.	20 min	
Penetration, 25C, 100g/5 sec, dmm	ASTM D5				20-80	
Penetration, 4C, 200g/60 sec, dmm	ASTM D5					20-70
Kinematic Viscosity, 140°F, cSt	ASTM D2170	100-200	1,000-9,500			
Accelerated Weathering test [5]	ASTM D4799				Plant certification within 12 months	
Test on		Evaporative Residue	Evaporative Residue			Rejuvenating Agent Base
Asphaltenes, % w	D2006	1.0 max	10.0 Max.			1.0 max
Maltene Dist. Ratio $(PC+A_1)/(A_2+S)$	D2006	0.3-0.6	0.2-1.4			
PC/S Ratio[45] (Note 4)	D2006	0.5 min	0.5 min.			
Saturated Hydrocarbons,S[5(note 4)]	D2006	28 max	28 max.			30 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170					50-175
Flash point °F	ASTM D92					375 min
Test on residue from RTFO:	ASTM D2872					Rejuvenating Agent Base
Mass Change, %,	ASTM D2872					6.5 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170					Report
Kinematic Viscosity, Ratio [6]						3.0 max

Notes:
1. Kreb units (ASTM D562)
2. Flash point on residue may be waived by the engineer during production sampling and testing provided manufacturer submits results performed in the previous 12 months in compliance.

3. Viscosity in poise may be determined using AASHTO T315 by converting the Complex Dynamic Shear Viscosity to Viscosity in poise.
4. Elastic Recovery molds shall have straight sides as shown in Fig. 1 of AASHTO T301
5. Other Accelerated Weathering test procedures may be presented for acceptance by the engineer prior to project start. These results shall be provided at no additional cost to the agency.
6. Kinematic Viscosity Ratio will be setermined by dividing the viscosity of the material after RTFO aging by the original viscosity.

A full set of tests shall be performed by as specified by the special provisions in the undiluted condition. These tests and any other specified will be performed at the contractor's expense.
Only residue by evaporation shall be run on diluted samples. Specification limits should be diluted rate times minimum residual value of concentrate.

718.3 TEST METHODS AND REQUIREMENTS SEALCOATING

Sealcoating material for asphalt concrete pavement, shall be a concentrate product "ready to use" from the manufacturer. No product dilution will be allowed at the project site during application. Sealcoating shall consist of two applications across full width of pavement surface. Edge application treatment shall also be two separate coats. Each applied coat shall be at the following minimum application rates. First coat shall be applied at a minimum application rate of 0.15 gallons per square yard, followed by a second coat applied at a minimum rate of 0.15 gallons per square yard. Application rate for each coat, above the minimum, shall be adjusted to meet the pavement surface conditions.
Material, applied as sealcoating, shall meet the requirements on table 718-2 by certification from the manufacturer.

Tests shall be performed by AMRL accredited laboratory.

TABLE 718-2		
SEALCOATING SPECIFICATIONS		
Properties * (note 2)	Method	Specification
Weight per Gallon, 25C, lbs/gal	ASTM D2939.07	10.0 min
Residue Content by Evaporation, %	ASTM D2939.08	50 min
Asphalt Content by Weight, %	ASTM D2939.21	17 min
Wet Track Abrasion Test [1], 1 hour, grams/sq. ft.	ASTM D3910	15 max
Wet Track Abrasion Test [1], 6 day, grams/sq. ft.	ASTM D3910	15 max

Notes
1. Wet track abrasion patties shall be produced by two applications of sealcoat material dried to constant weight between each coat.

- End of Section -

SECTION 322
ASPHALT STAMPING

322.1 GENERAL REQUIREMENTS:

Asphalt stamping creates an imprinted surface pattern and/or installs color coatings to the surface of a newly constructed asphalt pavement.

A Contractor shall meet the following qualifications in order to perform asphalt stamping:

The Contractor shall have completed a minimum of three (3) asphalt stamping projects in the past year (from the date of bid) in the State of Arizona and totaling at least 50,000 S.F. Provide proof of completion of work to three or more government entities within Arizona in last (3 or 5) years totaling 50,000 sq. ft. or more. The Contractor shall furnish evidence of meeting these experience requirements to the Engineer, including all current referral contacts on these projects for verification at the time of bid submittal. Mock ups may be required at the owner's discretion to ensure Contractor familiarity with product and installation procedures. Acceptance of colors and application procedures should be accepted in writing from the agency/owner prior to commencement of work.

Contractor's field supervisor on the above qualifications shall have been in employment for five years continuous. Field supervisor shall have been on all qualified projects from onset to completion. Field Supervisor name and proof of employment maybe required at the time of bid.

On site or in person Pre-bid meeting held by the local governing agency is mandatory for extended information and release of plans for the project. Bid will be rejected if unattended.

The Contractor shall submit for review and approval all manufacturer product and technical data for materials proposed to be installed in the right-of-way. The Contractor shall also submit for review and approval a sample of the stamped asphalt material prior to installation. These submittals shall be submitted to the Engineer.

322.2 MATERIALS:

All products used in the surfacing system shall meet the minimum physical and performance properties in Table 322-1. The Contractor shall submit a Certificate of Compliance to the Engineer indicating that the materials to be included in the work meet these specification requirements. The color used for painted asphalt shall be as per the bid documents or as approved by the Agency.

TABLE 322-1

ASPHALT STAMPING SURFACING SYSTEM PHYSICAL PROPERTIES

CHARACTERISTIC	TEST SPECIFICATION	TEST RESULT – BASE
Solids by Volume (%)	ASTM D2697	68% Min
Solids by Weight (%)	ASTM D2369	78% Min
Density	ASTM D1475	13.7 lbs./gal Min

TABLE 322-1		
ASPHALT STAMPING SURFACING SYSTEM PHYSICAL PROPERTIES		
CHARACTERISTIC	TEST SPECIFICATION	TEST RESULT – BASE
Dry-Time (To Recoat)	ASTM D5895	20 Min
Taber Wear Abrasion Dry H-10 Wheel	ASTM D4060 1 day cure	0.16 g/1000 cycles Max
Taber Wear Abrasion Wet H-10 Wheel	ASTM D4060 7 days cure	2.34 g/1000 cycles Max
QUV E Accel.	ASTM G154 Delta	0.53 Min
Hydrophobicity Water Absorption	ASTM D-570	7.6% (9 Day Immersion) Max
Shore Hardness	ASTM D2240	67 Type D Min
Mandrel Blend	ASTM D522-93A	1/4" @ 21 Degree C Pass Min
Permeance	ASTM D1653	3.77 g/m2 /hr. (52 mils) Max
VOC	Per MSDS	25 g/l Max
Adhesion to Asphalt	ASTM D4541	Substrate Failure
Friction Wet	ASTM E303 British Pendulum Tester	WP * Coated- 62 Min WP* Uncoated - 59 Min AC ** Coated - 70 Min AC ** Uncoated - 61 Min
Cure Time	Measured @ 77 Degrees Fahrenheit	Dry to touch – 20 Min Light Foot/Vehicle Traffic – 2-4 Hrs. Full Cure – 5 to 7 days

322.3 INSTALLATION & SURFACE PATTERNING:

The patterning equipment shall be metal templates that shall correspond to the patterns shown in Owner's standard details or as shown on the plans and called out in special provisions. Refer to the project plans and specifications for the pattern type to be used.

The Contractor shall obtain the Engineer's approval prior to beginning asphalt stamping.

When new asphalt is to be stamped, it shall have one overnight period to set prior to stamping for conventional mixes and ARAC mixes shall have 30 days to set prior to the stamping/coating process. Asphalt shall be fully compacted prior to positioning the patterning template and meet all the requirements set forth in Sections 321 or 325 as applicable.

For raised medians and other areas not subject to vehicular traffic, the surface course shall be at least 2-1/2" of 1/2" or 3/8" Marshall Low Traffic asphalt concrete mix in accordance with Section 710, or as approved by the engineer.

The asphalt to be stamped shall be uniformly heated using infrared technology to a temperature that shall not exceed 280 degrees Fahrenheit. Templates shall be set in place using a plate compactor and fully embedded into the asphalt.

The template imprint depth shall be 3/8" over 95% of the patterned area. Template print depth shall be inspected prior to coating to ensure compliance. All hand tooling shall be complete, full depth, aligned vertically, and shall extend to the edge of the asphalt pavement, common edge, concrete curb, gutter, or other border. There shall be no over print or shadowing of patterns and no remnants of excess print on surrounding unintended areas. Should overprinting or other imperfections occur, these areas shall be repaired by using the same process outlined in this section to return the asphalt to a smooth condition to that of the unstamped area(s).

322.3.1 Surfacing System (Painted Asphalt & Clear Coat Sealant): The air temperature shall be at least 45° F and rising before the application of surface system products begins. There shall also be no precipitation expected within 24 hours of the anticipated surfacing completion. The surface shall be free from laitance, grease, deleterious oils, or any other foreign matter prior to placing any pavement coating.

The surfacing system products shall be spray-applied. Where required to cover small areas, the surfacing system may be applied using brooms or brushes. When complete, the entire asphalt surface shall be uniformly covered with the surfacing product with no exposed asphalt present.

The Contractor shall use sufficient masking to ensure that the surface system products are applied only where specified. Masking shall be complete and no overspray, or other imperfections, onto surfaces not designated as coated surfaces shall be allowed.

The Contractor shall apply the surface system products with a minimum of four complete passes on a roadway surface. Three complete passes shall be allowed on medians, walkways, pathways, and bike paths where traffic is primarily pedestrian with minimal or no automobile traffic. After the colorant has had sufficient time to set, a minimum of two coats of a clear coat sealant shall be applied.

Total thickness of the surfacing product shall be 20 mils in thickness or greater including the sealant.

After the surfacing system products have been applied, the treated asphalt shall not be exposed to vehicular traffic for eight (8) hours.

322.4 MEASUREMENT:

Approved and accepted asphalt stamping installations shall be measured by the square foot for asphalt surface patterning with color coating and for asphalt surface color coating without surface patterning. The measurement for asphalt stamping specialty design shall be the number of approved and accepted installations of each specialty design.

322.5 PAYMENT:

Payment for specialty designs, for Asphalt Surface Patterning With Color Coating, and for Asphalt Surface Color Coating Without Surface Patterning shall be at the contract unit price and shall be full compensation for furnishing all labor, material, tools, equipment and incidentals, and doing all work

involved in the installation of asphalt stamping complete in place, in compliance with the contract documents.

322.6 WARRANTY:

Asphalt color coating shall have a two year warranty from flaking, premature wearing and like defects. Color changes shall not be part of the warranty.

Warranty repair shall be at the expense of the Contractor. Areas that require recoating shall receive a light scuffing to remove the clear coat sealant prior to reapplication of the color coating and sealant.

MARICOPA COUNTY
Department of Transportation

MEMORANDUM

Date: June 3, 2015

To: MAG Specifications and Details Committee

From: Robert Herz, MCDOT Representative

Subject: Miscellaneous Corrections **Case 15-01 D**

PURPOSE: Correction of titles on Detail 270

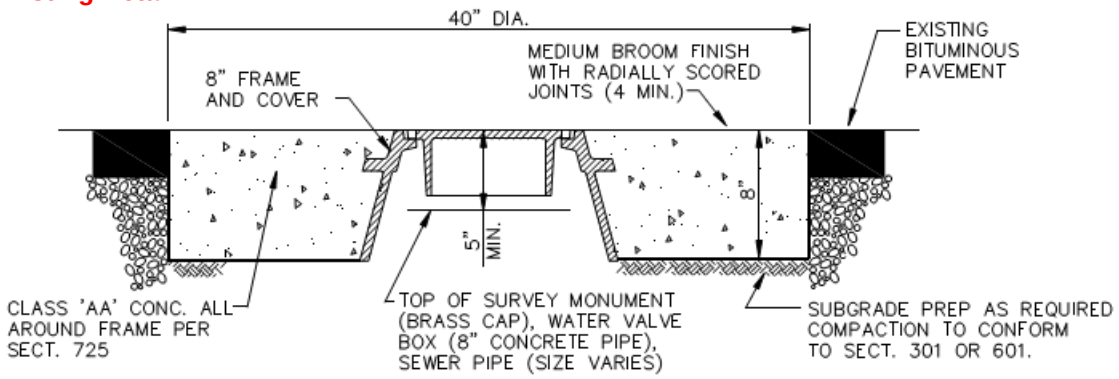
REVISION:

Correction 1 – **Detail 270 Title**

Title shown on current Detail: FRAME AND COVER
Requested corrected Detail title: **FRAME & COVER AND GRADE ADJUSTMENT**

Title shown in current index: FRAME AND COVER (AND GRADE ADJUSTMENTS)
Title shown in index prior to 2001: FRAME & COVER AND GRADE ADJUSTMENT

Correction 2 – Title lines are currently in reverse order for the grade adjustment detail.
Existing Detail:



CLEAN OUT FRAME & GRADE ADJUSTMENT
WATER VALVE, SURVEY MONUMENT, OR SEWER

Corrected Title:

WATER VALVE, SURVEY MONUMENT, OR SEWER
CLEAN OUT FRAME & GRADE ADJUSTMENT

2901 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-4760 Fax: 602-506-5969

Date: June 2, 2015

To: MAG Specifications and Details Committee

From: Jeff Benedict, Chairman MAG Asphalt Working Group

Subject: Revisions to Sections 321 **Case # 15-09**

PURPOSE: Incorporate revisions to Section 321, "*PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT*" into the MAG Specifications.

REVISIONS:

321.8.4 - Removed placement temperature table and replaced with simple minimum placement temperature of 265 °F. Existing table was too complex and difficult to implement. Current approach can result in required minimum mix temperature changing multiple times during the day depending on environmental and weather conditions. This could result in mix being rejected which was produced at the plant based on original project conditions which then change during transport. Also, temperature measuring devices being used on underlying base (infrared guns) are only accurate to approximately ± 20 °F, potentially resulting in incorrect mix temperature being required.

321.10.2 - Added and/or revised wording for binder content and laboratory air voids to indicate that Contractor must obtain the approval of the Engineer to perform additional coring to determine the limits or extent of a deficiency.

321.10.4 - Added and/or revised wording for pavement thickness to indicate that Contractor must obtain the approval of the Engineer to perform additional coring to determine the limits or extent of a deficiency.

321.10.5.2- Added wording to indicate that acceptable in-place air voids must fall within a range; i.e. there is both a lower and upper limit.

321.10.5.2- Deleted note from Table 321-5 related to in-place air voids since this table is intended to address Laboratory air voids only.

321.10.5.2- Revised wording for additional coring to correctly reflect intent of verifying a deficient in-place air void test result.

321.10.5.2- Also added and/or revised wording to indicate that Contractor must obtain the approval of the Engineer to perform additional coring to determine the limits or extent of a deficiency.

321.10.5.2- Deleted note from Table 321-8 and moved information into table itself to improve clarity.

321.10.5.2- Deleted parentheses, space, and colon from heading of column 3 of Table 321-8 to match formatting in rest of Section 321.

case of the screed, auger extensions and vibrators shall be installed wherever the screed is extended more than one (1) foot beyond the end of the base auger or auger extension. However, when placing material against an extremely uneven curb or edge over a short distance, the Engineer may waive the auger extensions and vibrators.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers to provide a uniform and smooth layer over the entire area compacted in this manner.

321.8.2 Joints: Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth exposing a fresh face. The fresh face shall be tack coated prior to placement of the new asphalt concrete. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than 1/4 inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline.

Longitudinal joints of each asphalt course shall be staggered a minimum of 6 inches with relation to the longitudinal joint of the immediate underlying course's cold longitudinal construction joint.

Longitudinal joints with existing or cold (more than 32 hours old) asphalt concrete shall require the existing pavement to be trimmed to a vertical face for its full depth exposing a fresh face. The fresh face shall be tacked prior to placement of the adjacent course. Longitudinal joints with an existing asphalt pavement that is less than 32 hours old that has had its edge protected from damage may have adjacent new asphalt concrete placed after applying the required tack coat. After placement and finishing of longitudinal joints, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, in any direction.

321.8.3 Asphalt Leveling Course: A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course. If a leveling course is being applied on an Asphalt surface, a tack coat shall be applied. The compaction requirements contained in Section 321.10 do not apply to leveling courses.

321.8.4 Compaction; Asphalt Base Course and Surface Course: It is the contractor's responsibility to perform Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. The temperature of the asphalt concrete immediately behind the laydown machine shall ~~meet the minimum requirements of Table 321-2~~be at least 265 °F,- unless WMA technology is being used. If WMA technology is being used then the minimum requirements will be stated within the mix design recommended by the WMA manufacturer. A probe type electronic thermometer with a current calibration sticker attached will be used to measure the temperature of the asphalt concrete mixture. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat. ~~The minimum temperatures in Table 321-2 do not guarantee that the asphalt mix will be compacted to the required density.~~ The contractor is responsible to achieve the required compaction.

~~TABLE 321-2~~						
~~MINIMUM ASPHALT CONCRETE PLACEMENT TEMPERATURE~~						
~~Base (1) Temp (°F)~~	~~Mat Thickness (inches)~~					
	~~1/2~~	~~3/4~~	~~1~~	~~1 1/2~~	~~2~~	~~3 and greater~~
~~40 – 50~~	~~—~~	~~—~~	~~310~~	~~300~~	~~285~~	~~275~~
~~50 – 60~~	~~—~~	~~310~~	~~300~~	~~295~~	~~280~~	~~270~~
~~60 – 70~~	~~310~~	~~300~~	~~290~~	~~285~~	~~275~~	~~265~~
~~70 – 80~~	~~300~~	~~290~~	~~285~~	~~280~~	~~270~~	~~265~~
~~80 – 90~~	~~290~~	~~280~~	~~270~~	~~270~~	~~265~~	~~260~~
~~+90~~	~~280~~	~~275~~	~~265~~	~~265~~	~~260~~	~~255~~

~~(1) Base on which mix is to be placed~~

Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements. During the rolling operation, the speed of the roller shall not exceed 3 miles per hour, unless otherwise approved by the Engineer.

TABLE 321-3A				
GRADATION ACCEPTANCE LIMITS FOR MARSHALL MIXES				
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	Base Mix
1 inch	---	---	---	±7%
3/4 inch	---	---	±7%	±6%
1/2 inch	---	±7%	---	---
3/8 inch	±7%	±6%	±6%	±6%
No. 8	±6%	±6%	±6%	±6%
No. 40	±4%	±4%	±4%	±4%
No. 200	±2%	±2%	±2%	±2%

TABLE 321-3B			
GRADATION ACCEPTANCE LIMITS FOR GYRATORY MIXES			
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix
3/4 inch	---	---	±7%
1/2 inch	---	±7%	±6%
3/8 inch	±7%	±6%	---
No. 8	±6%	±6%	±6%
No. 40	±4%	±4%	±4%
No. 200	±2%	±2%	±2%

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3A or 321-3B as applicable, a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits the Contractor shall cease production of asphalt concrete. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in Table 321-3A or 321-3B as applicable.

If the asphalt binder content is within ± 0.40% of the mix design target value, the asphalt concrete will be paid for at the contract unit price. If the asphalt binder content deviates by more than ± 0.40% from the mix design target value, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient sample. The asphalt content of the original deficient sample will be averaged with the asphalt binder content of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the asphalt binder content deviates by more than ± 0.40% from the mix design target value, then Table 321-4 shall apply to the sublot. Upon approval of the Engineer, the Contractor may obtain ~~A~~additional cores ~~may be required~~ to define the limits of the deficient area, ~~and~~ but these additional cores shall not be used for re-evaluating acceptance.

TABLE 321-4		
ASPHALT BINDER CONTENT ACCEPTANCE AND PENALTIES		
Deviation from that permitted	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Over 0.2% above that permitted	Removal* or EA	Removal* or EA
Over 0.1% to 0.2% above that permitted	$6.00	EA
Over 0.0% to0.1% above that permitted	$2.00	EA
Within permitted range	Full Payment	No Corrective Action
Over 0.0% to0.1% below that permitted	$2.00	EA
Over 0.1% to 0.2% below that permitted	$6.00	EA
Over 0.2% below that permitted	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 321.10.6

If the laboratory air voids fall within a range of 2.8% to 6.2%, the asphalt concrete will be paid for at the contract unit price. If the laboratory air voids are outside of this range, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient sample. The laboratory air voids of the original deficient sample will be averaged with the laboratory air voids obtained from each of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the laboratory air voids is outside the indicated range, then Table 321-5 shall apply to the sublot. Upon approval of the Engineer, the Contractor may obtain additional cores to define the limits of the deficient area, but these additional cores shall not be used for re-evaluating acceptance.~~Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.~~

TABLE 321-5		
LABORATORY VOIDS ACCEPTANCE AND PENALTIES		
Laboratory Air Voids (Measured at N_{des} or 75 blows as applicable)	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Less than 1.5%	Removal* or EA	Removal* or EA
1.5-2.0%	$5.00	EA
2.1-2.7%	$2.00	EA
2.8-6.2%	Full Payment	No Corrective Action
6.3-6.9%	$2.00	EA
7.0-8.0%	$5.00	EA
Greater than 8.0%	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient
EA = Engineering Analysis per Section 321.10.6

~~Removal for In-place Air Voids Greater than 11.0% is not eligible for Section 321.10.6.~~

If an agency or Engineer is purchasing asphalt concrete directly from a commercial material supplier, the agency or Engineer will use Section 321.10, and specifically Tables 321-3A or 321-3B as applicable, 321-4 and 321-5 from Section 321.10, when determining the acceptance of the asphalt concrete with the material supplier.

321.10.3 Surface Testing: If directed by the Engineer surface drainage test shall be performed. The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer's satisfaction at the Contractor's expense. Water for this testing shall be provided and paid for by the Contractor.

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

321.10.4 Asphalt Pavement Thickness: Asphalt Pavement thickness will be determined from cores secured from each lift of each sublot. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found in Section 321.14. Each core location will be patched by the party responsible for the testing.

Acceptance or assessment of penalties for asphalt pavement thickness will be based on the combined total thickness of all asphalt concrete layers omitting all layers of asphalt-rubber asphalt concrete. If the final total pavement thickness exclusive of all ARAC layers is deficient from the target thickness by 0.25 inches or less, it will be paid for at the contract unit price.

If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is not the owner (i.e. permits) the following steps will apply:

(1) If the thickness deficiency of the pavement exceeds 0.25 inch, the limits of the deficient area will be evaluated by coring at maximum intervals of 100 feet from the deficient core. The thicknesses of the original deficient core will be averaged with the thicknesses of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements. If the resulting average thickness deficiency is greater than 0.25 inch, and subject to approval of the Engineer, the Contractor may obtain additional cores to define the limits of the deficient area, but these additional cores shall not be used for re-evaluating acceptance.~~additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.~~

(2) If the pavement thickness from step one above deviates from the target thickness by more than 0.25 inch but not more than 0.50 inch, corrective action will be required. This corrective action will consist of application of a Type II slurry seal coat in accordance to Section 715. The Contractor may present an engineering analysis outlining other proposed remedial measures for the consideration of the Engineer. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures.

(3) If the pavement thickness from step one above deviates from the target thickness by more than 0.50 inch, corrective action will be required. The deficient area shall be overlaid with no less than a 1 inch thick lift, for the full width of the pavement to meet or exceed the designed thickness, with appropriate end and edge milling, with a mixture approved by the Engineer. The Contractor may present an engineering analysis outlining other proposed remedial measures for the Engineer's consideration. The Engineer will review the engineering analysis and decide within 10 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the engineering analysis, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

If the contracting Agency is the owner and the pavement thickness deficiency is greater than 0.25 inches but less than 0.50 inches Table 321-6 will apply. If the pavement thickness deficiency is greater than 0.5 inches the deficient area shall be overlaid with no less than a 1-inch thick lift for the full width of the pavement to meet or exceed the designed thickness using an asphalt mixture approved by the Engineer. The Contractor shall provide appropriate end and edge milling. The overlay

or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found in Section 321.14. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

If the pavement density has in-place voids of between 4.0% and 8.0%~~ or less~~, the asphalt concrete will be paid for at the contract unit price. If the acceptance core for a sublot indicates that the pavement density has in-place voids of less than 4.0% or greater than 8.0%, ~~the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient core(s). If both cores in a sublot are deficient,~~ the deficient area will be evaluated by coring two additional locations at maximum intervals of 100 feet from the deficient core. The in-place voids of the original deficient core will be averaged with the in-place voids of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements**.** If the resulting average of the in-place voids is outside the indicated range, then Table 321-8 shall apply to the sublot. ~~3 to 4 additional cores may be necessary to re-evaluate acceptance. The in-place voids of all the original core(s), whether deficient or acceptable, will be averaged with the in-place voids of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-8 shall apply to the sublot.~~ Upon approval of the Engineer, the Contractor may obtain additional cores to define the limits of the deficient area, but these additional cores shall not be used for re-evaluating acceptance.~~Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance~~.

TABLE 321-8		
PAVEMENT DENSITY PENALTIES		
Limits of In-place Air Voids for design lift thicknesses 1.5 inches and greater	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner; ~~(~~i.e. permits~~):~~ Corrective Action
Below 3.0%	Removal* or EA	Removal* or EA
3.0% to below 4.0%	$10.00	EA and Type II Surry Seal
4.0% to 8.0%	Full Payment	No Corrective Action
Greater than 8.0% to less than 9.0%	$6.00	EA
9.0% to 10.0%	$10.00	EA and Type II Surry Seal
Greater than 10.0%	Removal* or EA	Removal* or EA
Greater than 11.0%	Removal*	Removal*

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 321.10.6
~~Removal for In-place Air Voids greater than 11.0% is not eligible for Section 321.10.6.~~

321.10.6 Engineering Analysis (EA): Within 10 working days after receiving notice that a lot or sublot of asphalt concrete is deficient and is found to fall within the "Removal or EA" band per Table(s) 321-4, 321-5, and/or 321-8 the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties along with possible remediation(s) listed in the "Removal or EA" category. Engineering Analysis can also be proposed for non-removal categories of "Corrective actions" when the contracting agency is not the owner (i.e. permits).

The Engineering Analysis shall contain an analysis of the anticipated performance of the asphalt concrete if left in place. The Engineering Analysis shall also detail the effect of any proposed corrective action to the material(s) in place as it relates to

Date: May 29, 2015

To: MAG Specifications and Details Committee

From: Brian Gallimore, Chairman Materials Working Group

Subject: Revisions to Sections 321 **Case # 15-10**

PURPOSE: Incorporate revisions to Section 321, "*Rehabilitation Work*" into the MAG Specifications.

REVISIONS:

321.10.5.3 - Added this subsection to allow for some relief on asphalt density when provisions for reworking substandard bases (removals) or existing asphalts (overlays) to meet Section 310 or Section 321 for overlays are missing from bid documents or scope of work.

Currently, industry is being held to same standards on spot removals and edge mill/overlays as new construction over optimal base materials.

or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found in Section 321.14. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

If the pavement density has in-place voids of 8.0% or less, the asphalt concrete will be paid for at the contract unit price. If the pavement density has in-place voids greater than 8.0%, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient core(s). If both cores in a sublot are deficient, 3 to 4 additional cores may be necessary to re-evaluate acceptance. The in-place voids of all the original core(s), whether deficient or acceptable, will be averaged with the in-place voids of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-8 shall apply to the sublot. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 321-8		
PAVEMENT DENSITY PENALTIES		
Limits of In-place Air Voids for design lift thicknesses 1.5 inches and greater	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Below 3.0%	Removal* or EA	Removal* or EA
3.0% to below 4.0%	$10.00	EA and Type II Surry Seal
4.0% to 8.0%	Full Payment	No Corrective Action
Greater than 8.0% to less than 9.0%	$6.00	EA
9.0% to 10.0%	$10.00	EA and Type II Surry Seal
Greater than 10.0%	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 321.10.6
Removal for In-place Air Voids greater than 11.0% is not eligible for Section 321.10.6.

321.10.5.3 Rehabilitation Work

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In-place voids on rehabilitation work should take into consideration the underlying base materials and not be subject to penalties in Table 321-8, other than in place voids shall not exceed 10%. Rehabilitation work shall be considered any mill and overlays or remove and replace projects that do not have provisions for reworking the base materials to compaction standards set forth in Section 310 or Section 321 (overlays).

321.10.6 Engineering Analysis (EA): Within 10 working days after receiving notice that a lot or sublot of asphalt concrete is deficient and is found to fall within the "Removal or EA" band per Table(s) 321-4, 321-5, and/or 321-8 the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties along with possible remediation(s) listed in the "Removal or EA" category. Engineering Analysis can also be proposed for non-removal categories of "Corrective actions" when the contracting agency is not the owner (i.e. permits).

Date: May 29, 2015

To: MAG Specifications and Details Committee

From: Jeff Benedict, Chairman MAG Asphalt Working Group

Subject: Revisions to Sections 717 **Case # 15-11**

PURPOSE: Incorporate revisions to Section 717, "*Mix Design Requirements*" into the MAG Specifications.

REVISIONS:

717.3.1 - Added clarification in regard to the mineral admixture calculation as prescribed under the Arizona Test Method 832. Currently, admixtures are incorporated as a percentage of the total aggregate when submitting new designs and are approved as such. That is the admixture is seen as a percentage of the aggregate (totals 100%).

The Arizona Test Method 832 is an ADOT method requiring admixtures to be back calculated after the aggregates are determined (totals 101 – 102% and must be back calculated to 100% proportionately by each percentage of contributing aggregates to the mix)

TABLE 717-4		
COARSE/FINE AGGREGATE REQUIREMENTS		
Characteristics	**Test Method**	**Requirements**
Fractured Faces, % (Plus No. 8)	ARIZ-212	85, 1 fracture 80, 2 or more
Uncompacted Voids, %	ARIZ-247	45.0 (High Traffic Volume) 42.0 (Low Traffic Volume)
Sand Equivalent (Minus No. 4)	AASHTO T-176	65 minimum
Plasticity Index	AASHTO T-89 & T-90	Non Plastic
L.A. Abrasion, % Loss	AASHTO T-96	9 max. @ 100 Rev. 40 max. @ 500 Rev.
Combined Bulk Specific Gravity	AI MS-2	2.35-2.85
Combined Water Absorption, %	AI MS-2	0-2.5

717.2.3 Mineral Admixture: Mineral admixture used in ARAC shall be dry hydrated lime conforming to the requirements of ASTM C1097 or Portland cement conforming to ASTM C150 for Type II, or ASTM C595 for Type IP. The minimum mineral admixture content will be 1.0percent, by weight of total aggregate.

717.3 MIX DESIGN REQUIREMENT:

717.3.1 General: The mix design for ARAC shall be prepared by a laboratory that is accredited through the AASHTO Accreditation Program (AAP) in Hot Mix Asphalt Aggregates and Hot Mix Asphalt. The laboratory shall be under the direct supervision of a Civil Engineer, registered by the State of Arizona, and who is listed by ADOT as a "Qualified Asphalt Concrete Mix Design Engineer" within ADOT's latest list of approved laboratories. The latest list of approved laboratories is available on ADOT's web page: http://www.azdot.gov/highways/materials/quality_assurance.asp.

The date of the design shall not be older than two years from the date of submittal, unless supportive documentation is provided and approved by the Engineer.

The mix design method used shall be in accordance with the Marshall Mix procedure, 75 blows, as described in Arizona Test Method 832 "Marshall Mix Design Method for Asphaltic Concrete (Asphalt Rubber) [AR-AC]", with the exception that mineral admixture shall be considered part of the total weight of aggregate and pounds per cubic foot shall be calculated by using Asphalt Institute's Manual MS-2. Mix designs are subject to approval by the Engineer.

Comment [GG1]: This wording makes it consistent with current designs that have been submitted and approved by MCDOT.

717.3.2 Mix Design Criteria: The mix shall comply with the criteria in Table 717-5 below.

TABLE 717-5		
MARSHALL MIX DESIGN CRITERIA		
Criteria	Low Volume Traffic	High Volume Traffic
ARB Content 1" and 1-1/2" Overlay Thickness 2" Overlay Thickness	 8.4% minimum N/A	 8.0% minimum 7.0% minimum
Mixture Air Voids, %	3.5-4.5	4.5-5.5
Voids in Mineral Aggregate, %	19.0 min	19.0 min
Tensile Strength Ratio, AASHTO T-283	65% minimum	65% minimum
Marshall Stability, pounds minimum	800	800
Marshall Flow, 0.01 inch minimum	16	16

The mix design report shall include the following elements as a minimum.

(1) The name and address of the testing organization and the person responsible for the mix design report.

(2) The mix plant identification and/or location, as well as the supplier or producer name.

(3) The traffic condition (low or high traffic) and lift thickness.

(4) A description of all products that are incorporated in the ARAC along with the sources of all products, including the base asphalt cement, crumb rubber, mineral aggregate, and admixtures.

SECTION 608
HORIZONTAL DIRECTIONAL DRILLING

608.1 DESCRIPTION:

This specification covers requirements for installation of underground infrastructure using the trenchless technology method known as Horizontal Directional Drilling (HDD). All installations shall be in accordance with the approved HDD Consortium's "Horizontal Directional Drilling Good Practices Guideline, third edition" and updates thereof.

The HDD method involves first drilling a pilot bore in the location(s) as indicated on the plans, next enlarging the drilled pilot bore to facilitate the installation of the required pipe line or bundle, herein referred to as the "product pipe". The pilot bore is enlarged approximately 1.5 times the size of the product pipe and is pulled into the enlarged borehole.

Installations are classified as small, medium or large which serves as a general indication of the level of equipment required for the installation. The size of bore is measured in inch-feet and is calculated by multiplying the nominal product pipe diameter in inches multiplied by the minimum allowable length of crossing in feet as indicated on the plans or as can reasonably be inferred from the locations of such bends, fittings, service connections, valves and any other equipment requiring excavation and/or connection to the pipe line at a specified location. The bore shot size refers to each individual bore shot, not the total footage of the permitted design.

Bore size calculation: 200 foot installation of a 4 inch diameter pipe has a bore size of 800 in-ft.
(200ft × 4in = 800 in-ft)

Table 608-1	
Classification of Bore Sizes	
Classification	**Bore Size**
Small	Up to 6,000 in-ft
Medium	6,001 in-ft to 15,000 in-ft
Large	Above 15,000 in-ft

608.2 HHD TERMS AND DEFINITIONS:

a. Pilot Hole: The initial controlled drilled horizontal shaft used to guide the enlargement to design size and eventual installation of the pipe.
b. Reaming: The back reaming hole opener is attached to the drill pipe and rotated and pulled back through the pilot hole to enlarge the bore in one or more passes to the size for pipe installation.
c. Pullback: The pipe installation pulled back by a swivel/pulling head connected behind the reamer, which pulls the prepared pipe into place.
d. Drilling Fluids: Fluids consisting of water, bentonite, and any approved additives such as environmentally safe polymers, lubricants, and viscosifiers.
e. Bore-tracking Equipment: Methods and systems generally defined as a walkover or non-walkover. To be specified by the Contractor and used to measure the actual accuracy of the bore to the specific line and grade. The bore path is monitored during the pilot bore by taking periodic readings of the inclination and azimuth of the probe located within the drive bit.
f. Bore-tracking Pit: An excavated area for entry, exit, slurry sump pits or any other excavation used to manage, control and track the progress of the bore.
g. Critical Structure: Any pipeline, utility, building, structure, bridge, pier, or similar construction partially or entirely located within a zone of active excavation.

608.3 MATERIALS:

All product pipe material shall be of the size type and classes shown on the plans.

Sectional pipe is pipe that requires assembly of the joints, such as a bell and spigot type pipe, shall be of a type that is specifically designed for installation by HDD.

Non-sectional pipe is pipe that requires joining together by a fusion or welding process. It is assembled prior to pulling the product pipe into the bore hole.

Non-sectional pipe that requires fusion of the joints, such as HDPE or Fusible-PVC, shall be fused by a skilled operator. The facility owner is responsible for maintaining a training program to ensure qualifications are maintained for joining procedures. Pipe manufacturer or accredited training agency certifications are also acceptable. Untrained personnel shall not be permitted to perform fusion of any pipe on the project. The contractor shall utilize a data-logger or manually record the following information for each fused joint in the product pipe line, unless the product pipe is pulled through a sleeve.

- Date and Time of joint
- Temperature
- Fusion pressure applied to joint
- Joining/Fusion time
- Cooling time

Non-sectional pipe used for dry utilities and/or as a sleeve will not require items listed above.

#14 or larger AWG solid tracer wire may be used if the product pipe is pulled through a sleeve and the tracer wire is pulled with the product pipe. Comply with ARS 40-360.22, para M.

608.4 RECORD DOCUMENTS AND SUBMITTAL REQUIREMENTS:

The Record Documents requiring submission to the Project Engineer for the facility owner are based on the bore size classification and are as shown in Table 608-2. The Contractor shall provide the indicated documents based on the bore size. The required items contained in items 1 through 9 shall be submitted to the Project Engineer for the facility owner prior to the authorization to commence field construction. Copies of all documents shall also be maintained at the construction site and be available for inspection.

Table 608-2
Submittal Requirements

	Bore Size Classification		
Required Record Document	**Small**	**Medium**	**Large**
1. Agency Approved Plans	•	•	•
2. Personnel Qualifications	•	•	•
3. Surface Survey		•	•
4. Bore Plan/Profile		•	•
5. Drilling Fluid Management Plan		•	•
6. Equipment & Site Setup			•
7. Drilling Fluid Pressure Calculations			•
8. Pipe Stress and Pullback Calculations			•
9. As-Built/Drillers Log	•	•	•

608.4.1 Agency Approved Plans: The facility owner shall submit plans for approval to the Agency in whose ROW the facility owner is proposing to install the new utility. Any changes from the approved plans will require a re-submittal of plans and re-approval. Identify all property lines, ROW, and easements. No work is to take place outside of the construction limits as show on the Agency Approved Plans.

608.4.2 Personnel Qualifications: The Contractor shall provide a competent and experienced individual who shall be present at all times while HDD operations are being performed. The individual shall be a responsible representative who is thoroughly familiar with the equipment and type of work and shall be in direct charge and control of the operation at all times. The individual shall possess experience with projects of a similar kind and nature, and have undergone appropriate training evidenced by a certificate of attendance from a training program,. Documentation of experience and training shall be .provided upon request.

608.4.3 Surface Survey: A surface survey is only required when specified by contract documents. Prior to starting the drilling operation the contractor shall submit to the Engineer a surface survey of elevations along the planned bore alignment, the maximum interval between elevations shall be ten feet (10'). Upon completion of the installation of the product pipe, the Contractor shall have a second survey performed and shall have the elevations compared with the pre-bore survey elevations. The second survey and the comparative results shall be submitted to the Engineer. Any change in elevation greater than ½" shall be considered excessive and shall be repaired at the Contractor's expense. Any elevation deviation of a flow line that is greater than ¼" shall be considered excessive and shall be repaired at the Contractor's expense.

608.4.4 Bore Plan/Profile: A scaled drawing of the pilot bore plan and profile shall be submitted by the Contractor. Show finished grade, the proposed pilot bore size and path, all existing utilities with minimum vertical and horizontal clearances.

608.4.5 Drilling Fluid Management Plan: Indicate the type and amount of the drilling fluid planned to be used on the project. Include MSDS sheets for the identified drilling fluid components and additives. The drilling fluid plan is developed based upon the anticipated soil conditions and a sufficient supply of fluid is to be available to enable successful completion of the bore. Indicate the intended method of disposal of spent drilling fluids and include approvals from off-site disposal sources. The Drilling Fluid Management Plan shall identify contingency measures to be employed in case of inadvertent returns. The contingency plan may include containment with sediment control devices, removal with vacuum equipment or other such contingency measures. In all cases, the plan shall indicate that should primary control measures fail and inadvertent returns cannot be controlled, work will be suspended until such a time as the plan can be revised and effective control measures can be implemented.

608.4.6 Equipment & Site Setup: Specifications on directional drilling equipment shall be utilized to ensure that the equipment will be adequate to complete the project. Equipment list is to include but not be limited to: drilling rig, mud system, mud motors (if applicable), down-hole tools, guidance system, and rig safety systems. Include calibration records for guidance equipment. Identify the site setup dimensions and where the equipment shall be located. Equipment shown on the site layout is to include but not be limited to: drilling rig, mud system, drill rod stock pile and mud return pit. Identify the pipe staging and assembly areas.

608.4.7 Drilling Fluid Pressure Calculations: Provide documentation sealed by the permitting agency's Arizona registered professional engineer for the calculations of minimum required and maximum allowable drilling fluid pressures anticipated throughout the bore to maintain drilling fluid circulation and minimize the occurrence of inadvertent returns. Indicate how such pressures shall be monitored and recorded throughout the progression of the bore. Provide manufacturers specifications for any down hole fluid pressure monitoring systems and properly calibrate such systems prior to commencing the installation.

608.4.8 Pipe Stress and Pullback Calculations: Submit documentation indicating the product pipe manufacturer's specified maximum allowable bending radius and maximum allowable pulling force for the pipe being installed. Provide calculations sealed by the permitting agency's Arizona registered professional engineer that show the anticipated bending radii for each segment of the pipe and the total anticipated pulling force required to complete the installation do not exceed the maximum allowable pulling forces for the pipe. The Drill Rig to be employed shall be capable of exerting a pullback force of at least 2 times that of the total anticipated pulling force required to complete the installation of the pipe specified. Furnish documentation indicating how the pulling forces introduced to the pipe

will be monitored and indicate the methods that will be employed to record such data and ensure that the force exerted on the pipe does not exceed the pipes maximum allowable pulling force.

608.4.9 As-Built/Drillers Log: Identify the installed location of the bore on a scaled drawing referencing any benchmark information provided on the original construction drawings. Also indicate the location of all existing utilities as provided on the original construction drawings and verified in the field as well as any undisclosed utilities as discovered in the field throughout the prosecution of this work. Also submit copies of any drilling fluid logs, pipe fusion logs and any other such information as it pertains to the work undertaken pursuant to this specification.

- Rod/joint number
- Time of recording
- Depth of locate reading
- Pitch, roll and clock-face.

608.5 CONSTRUCTION:

608.5.1 Horizontal Directional Drilling Equipment The HDD equipment is to have an electronic "walkover" tracking system or a Magnetic Guidance System (MGS) to accurately guide boring operations; a system to monitor maximum pullback pressure during pull-back operations; a system to detect electrical current from the drill string shall be in place with an audible alarm that automatically sounds when an electrical current is detected; a vacuum unit of sufficient capacity to handle the drilling fluid volume, and trained and competent personnel to operate the systems. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project.

608.5.2 Guidance System: An electronic "walkover" tracking system or a Magnetic Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface for continuous and accurate determination of the location of the drill head shall be used during the drilling operation. The locating system shall be capable of determining the in ground position of the drill head and shall be accurate to ±2% of the distance from the transmitter to the receiver. It shall enable the driller to guide the drill head by providing information on the pitch; roll and clock face orientation of the drill head. The locating system shall be capable of determining the depth of the drill head from the transmitter to the surface at any location along the path of the bore. The locating system shall be calibrated per the manufacturer's specifications prior to commencing the bore.

608.5.3 Drilling Fluid (Mud) System: A self-contained, closed, drilling fluid mixing system of sufficient size to mix and deliver drilling fluid composed of bentonite clay, uncontaminated water, and appropriate additives. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be of sufficient capacity to supply an amount of drilling fluid that is equal to the maximum rated output of the drilling fluid pump over at least fifteen minute duration. Ensure the drilling fluid is mixed per drilling fluid manufacturer's recommendations and continually agitate the drilling fluid during drilling operations.

Drilling fluid shall be uncontaminated water mixed with bentonite clay, polymer or appropriate drilling fluid additive. The Contractor shall be responsible to monitor drilling fluid properties and return fluid properties and shall modify the drilling fluid mix as appropriate for the soil conditions encountered. Contractor shall continually monitor and record any necessary drilling fluid properties such as viscosity as determined by a marsh funnel. The drill fluid pumping system shall be capable of delivering drilling fluid at a sufficient output rate and at minimum pressures as necessary to enable successful completion of the bore. Furnish pumping equipment and/or vacuum truck(s) of sufficient size to convey drilling fluid from containment areas, to storage and recycling facilities or disposal.

608.5.4 Directional Drilling Operation: Prior to drilling the pilot hole, "Walk" the bore path with the locating system as per the manufacturer's specifications attempting to identify any areas of potential interference and record the results of such inspections. Verify that all known utilities have been located and there is no conflict with the proposed work. Ensure all utilities that run parallel within 2'of the proposed work are exposed at intervals sufficient to determine there will be no conflict with the proposed work.

Profile the ground along the bore path every 10' and tie to an existing local temporary benchmark that will not be impacted by proposed construction. After the pull back is complete confirm the ground has not heaved, any heaving greater than 1" or settlement less than 1" will require the contractor to submit a plan to repair all damaged areas.

Determine the depth of the drill head every 10 ft or every rod length, whichever distance is greater. Record location information for the entirety of the bore, either manually in a driller's log or automatically via the locating system. Make all recorded readings and plan and profile information available at all times. Do not allow the deflection radius of the drill pipe exceed the deflection limits of the product pipe at any time throughout the crossing. Use white paint and mark the depth of the pilot bore on the ground at an interval not exceeding ten feet (10').

Stabilize the open bore hole by means of bentonite drilling slurry pumped through the drill rod and through openings in the drill head or reamer. The drilling slurry shall be in a homogenous/flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. Calculate the volume of drilling fluid required for each reamer pass based upon hole size and soil conditions. The driller shall not be permitted to "outrun his mud" which is the condition occurring when the drilling penetration or retrieval rate is generating cuttings at a rate faster than the drill fluid pumping system can suspend and convey the cuttings out of the bore hole.

Contain all drilling fluids in pits or holding tanks for recycling or disposal. Monitor drill fluid circulation throughout the duration of the bore activity and immediately take corrective actions to restore fluid circulation should circulation be lost.

Upon completion of the pilot bore, ream the bore hole up to a large enough diameter to accommodate the pullback of the product pipe. The final reamed hole opening shall be 1.5 times the outside diameter of the product pipe for pipe lines 24" or less, or no larger than 12" plus the outside diameter of the product pipe for pipe lines greater than 24".

Maintain a one foot (1') minimum separation between the outside of the pilot bore hole and the outside of the utility when no reaming is required to install the product pipe.

When the pilot bore hole is to be reamed maintain a minimum separation between the outside of the pilot bore hole and the outside of existing utility equal to one foot greater than the largest required reamer diameter.

608.5.5 Handling Product Pipe: Care shall be taken during transportation of the product pipe to prevent it from being cut, kinked or damaged. Use ropes, fabrics or rubber protected slings and straps when handling pipes. Do not use chains, cables or hooks inserted into the pipe ends. Use slings spread apart for lifting each length of pipe. Do not drop pipe or fittings onto rocky or unprepared ground.

Store pipe on level ground that is free of sharp objects that could damage the pipe. Limit the stacking of pipes to a height that will not cause excessive deformation of the bottom layers of pipe under anticipated temperature conditions. Where necessary due to ground conditions store the pipe on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

Handle assembled pipe in a manner that avoids damage to the pipe. The pipe is not to be dragged over sharp objects. Position slings to prevent stress on pipe joints. Product pipe that has cuts, gouges, or excessive deformation shall be removed and replaced.

608.6 MEASUREMENT:

Measurement of product pipe installed by HDD shall be by the lineal foot of pipe installed. Measurement shall be along the centerline of the product pipe, through all valves, fittings and manholes, from centerline to centerline of valves, fittings or structures or to the end of pipe.

608.7 PAYMENT:

Payment will be made at the contract unit price for each type and size of product pipe. Payment shall be compensation for furnishing all labor, material, tools, and equipment required for the horizontal directional drilled

installation of product pipe, complete in place, including all related excavation, shoring and bracing, backfill, and compaction. When specified payment shall also include, testing, disinfecting, and connections to existing lines or works.

- End of Section -

725.6 MIX DESIGN PROPORTIONING:

A concrete mix design carrying the producer's designated mix number for each type of concrete being furnished under these specifications shall be submitted to the Engineer at least once each year for approval. Each design shall utilize the proper proportioning of ingredients to produce a concrete mix that is homogeneous and sufficiently workable to provide a consistent and durable concrete product that meets the specified compressive strength and other properties as required by the application.

A concrete mix design submittal shall include the mix identification number and the applicable proportions, weights, and quantities of individual materials incorporated into the mix including the size and source of concrete aggregates, the type and source of cement and fly ash or SCM, and the brand and designation of chemical admixtures or other additives.

In the event there is a modification to the mix design proportions:

(A) Modifications that do not require a new mix design submittal/approval:

(1) Modifications which do not result in batch target weights for the fine aggregate or combined coarse aggregates changing by more than ~~5~~10 percent from the original approved mix design.
(2) Modifications to the percentage of coarse aggregate fractions that do not change the total coarse aggregate volume.
(3) Modifications to dosages of chemical or air-entraining admixtures, within the manufacturer's recommendations.
(4) The incorporation or elimination of chemical admixtures which are listed on the mix design to effect a change in the time-of-set (retarders or accelerators).

(B) Modifications that require a new mix design submittal/approval and may require performance verification:

(1) Modification to the class of concrete per Table 725-1.
(2) Modification to the type/class/source of cement, fly ash, natural pozzolan, or silica fume.
(3) Modification to the percentage of fly ash, natural pozzolan, or silica fume.
(4) Modification to a coarse aggregate size designation.
(5) Modification of the type of chemical admixture, or the incorporation or elimination, of an air-entraining admixture.
(6) Modification of coarse or fine aggregate source.

DRAFT

MARICOPA COUNTY
Department of Transportation

MEMORANDUM

Date: June 3, 2015

To: MAG Specifications and Details Committee

From: Robert Herz, MCDOT Representative

Subject: Revise Sections 321 and 325 to coordinate overlay work requirements. **Case 15-14**

PURPOSE: Coordinate overlay work requirements within Sections 321 and 325. Clarify measurement and payment for work associated with the construction of Safety Edges.

REVISIONS: Shown below using red-line strike-out format.

SECTION 321 - PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

321.13 PAYMENT:

The asphalt concrete measured as provided above will be paid for at the contract price per ton or square yard, as adjusted per Section 321.10, which price shall be full compensation for the item complete, as herein described and specified.

Payment for tack coat will be by the ton diluted, based on the rate of application, as directed by the Engineer.

No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and the mix design unit weight. The calculations and payment for overrun will be by individual pay item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit price.

Agency required repairs of existing pavement prior to roadway overlay operations will be paid for as a separate pay item.

Except as otherwise specified, no separate payment will be made for work necessary to construct thickened edges, safety edges, or other miscellaneous items or surfaces of asphalt concrete.

2901 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-4760 Fax: 602-506-5969

SECTION 325 - PLACEMENT AND CONSTRUCTION OF ASPHALT-RUBBER ASPHALT CONCRETE

325.1 DESCRIPTION:

Asphalt-rubber asphalt concrete (ARAC) consists of supplying, placing and compaction of plant-mixed, gap-graded ARAC over asphalt surfaces. The thickness of the finished ARAC overlay shall be within the range of one to two inches as shown on the plans or as specified in the special provisions. The provisions of Section 321.8.6 Asphalt Concrete Overlay shall apply to ARAC overlays, except placement, compaction, and surface smoothness shall be as specified in this section. The construction of safety edge construction when required shall comply with section 321.8.9.

325.11 MEASUREMENT:

ARAC shall be measured by the ton, for the mixture actually used, which shall include the required quantities of mineral aggregates, filler material, asphalt-rubber binder and admixture.

Application of lime water shall be measured by the square yard. The measured area shall be the area of ARAC pavement to which the lime water is applied. The measured area shall only be counted one time regardless of the number of applications applied to the ARAC pavement section.

Except as otherwise specified, no separate measurement will be made for work required for the construction of safety edges or for ~~S~~shoulder adjustment to match the new pavement surface elevation ~~shall not be measured~~. The cost of this work shall be included in the price paid for ARAC or other related pay items.

MAG Asphalt-Materials Working Group

Meeting Notes

Thursday, May 28, 2015, 12:00 pm at the ARPA Offices

Present:

See attached attendance sheet.

Discussion:

1) Case 14-06 Revision to section 718 for preservative seal (Sam H.)
   Sam was not present so there was no update.
2) Case 14-12 (MCDOT) pavement surface replacement (Bob Herz)
   Bob handed out the 5/18/15 revision of Section 336 with the modified roadmap and revisions to Detail 200-1 and 200-2. He will bring this to the Standards Committee at the next meeting.
3) Case 14-17 stamped asphalt (decorative) placement (Greg G.)
   Greg provided a copy of Bob Herz's comments on the 4/30/15 revised document and discussed the potential changes regarding removal of specific items that are present in other MAG Sections and therefore redundant in 322. A revised copy will be developed for further review.
4) Case 15-03 Backfill lift thickness. (Bob Herz)
   Bob handed out the 5/24/15 revision with specific language changes regarding the compaction wheel and process in 601.4.5.
5) Case 15-08 Clarification to section 710 tables (Bob Herz)
   There have not been any changes to the 3-26-15 revision so there was no discussion. This case is scheduled for a vote at the next Standards Committee meeting.
6) Case 15-09 Section 321 Density-temperature issue (Don C.)
   Don provided a 5/28/15 roadmap and revision. The group discussed the minimum temperature requirement resulting in the elimination of Table 321-2 and the measurement procedure. It was decided that a reference would be made to the table's origination document for user information – but not as a required part of the Section. The procedure for additional cores was discussed and agreed to be modified to require the Engineer's approval prior to any optional coring by the Contractor. The appropriate revisions will be made and submitted for continued review.
7) Section 321 Compaction over poor base (Brian G.)
   Brian provided additional language to be inserted at 321.10.5.3 regarding the level of required air voids in rehabilitation work. The Group discussed the requirements and potential location within 321 for this revised language - that would only be used for specific conditions. Brian will submit this to the Standards Committee at the next meeting as a new case.
8) Section 717 (Asphalt Rubber) Modification on incorporation of mineral admixture
   Greg handed out the last revision with clarification language in 717.3.1 regarding incorporation of mineral admixture with no changes. No real discussion over this item.
9) Lime Treated ABC (Dave Beckel)
   Dave was not present so there was no real discussion of this item.

Date for Next Meeting:

The next meeting is scheduled for **June 25, 2015 @ 1@:00 pm** in the ARPA offices.
Any and all participants are welcome and encouraged to be involved.

MAG Working Group

Thursday, May 28, 2015

Company Name	Name	E-mail Address	Signature
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MAG Concrete Working Group

Meeting Notes

Thursday, May 28, 2015, 1:30 pm at the ARPA Offices

Present:

See attached attendance sheet.

Discussion:

1) Revision to Section 725 – Jeff Hearne
   No revisions were presented to the 4/14/15 latest draft revision. Bob Hertz explained that John Shi has issues with the proposed change to the modification limit for coarse aggregates from 5% to 10% in regards to mix design re-submittal requirements. The resulting discussion focused allowing minor percentage changes to the individual aggregate constituents in order to maintain a consistent combined grading – to maintain better overall quality similar to existing procedures in Asphalt. This draft revision will be submitted to the Standards Committee as a Case at the next meeting.

2) New Pervious Concrete Sections – Jeff Hearne
   A revised draft of a new Section 3XX on field placement/maintenance (replacing the previous 6XX draft) and 7XX materials/mix design was presented as a starting point for additions and revisions – loosely modeled after the current California Greenbook Sections. A new handout of a current FHWA Pervious Concrete document was provided to the Group. Several attendees were unable to attend so no real discussion ensued.

Date for Next Meeting:

The next meeting is scheduled for **June 25, 2015 @ 1:00 pm** in the ARPA offices.
(Following the Asphalt and Materials Working Group meetings)

Any and all participants are welcome and encouraged to be involved.

MAG Concrete Working Group

Thursday, May 28, 2015

Attendance Initials					
GT	Gordon Tyus	MAG	Maricopa Association of Governments	602-254-6300	GTyus@azmag.gov
BH	Bob Herz	McDOT	Maricopa County	602-506-4760	rherz@mail.maricopa.gov
	John Shi	McDOT	Maricopa County		johnshi@mail.maricopa.gov
	Jacob Rodriguez	Utility	Salt River Project	602-236-8613	jacob.rodriguez@srpnet.com
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