ENGINEERING POLICY BALLOT

Effective: January 1, 2017

Level 2

Level two revisions require the approval of the **Assistant Chief Engineer** and the **Federal Highway Administration** only. The **Senior Management Team** is encouraged to review the content and provide comment to the appropriate director. For all other parties, these revisions are posted for information only.

ENGINEERING POLICY BALLOT

Effective: January 1, 2017

Issue 1: Floodplain Management, Farmland Conversion and FEMA Flood Buyout Properties

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Jo A. Dent – DE
Kyle E. Grayson – DE

Summary: The proposed revisions update EPG Art 127 to reflect new processes and forms associated with the Floodplain Management, Farmland Conversion and FEMA Buyout Properties.

Fiscal Impact: There is no fiscal impact anticipated with these revisions.

Publication: EPG Article 127

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

Issue 2: Epoxy Polymer Concrete Overlay

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Bill Dunn – BR

Summary: The proposed revisions incorporate a Bridge JSP on Epoxy Polymer Concrete Overlays into the Standard Specifications. The JSP has been used for 1 year to demonstrate effective performance and to allow industry comment. No industry complaints have been received and the performance has been satisfactory.

Fiscal Impact: There has been no fiscal impact with these revisions.

Publication: Std. Sec 623

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

ISSUE 3: Survey Staking to Facilitate the Relocation of Utilities

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Dennis Brucks – CM

Summary: Current Standard Specification 627.2.3 does not explicitly include the surveying and staking necessary for the relocation of utilities. This change clarifies that it is the responsibility of the contractor to provide surveying and staking to facilitate utility relocation which is occurring during construction.

Fiscal Impact: As contractors have not always included this work in contracts, requiring it may cause contract staking to increase slightly.

Publication: Std. Sec 627

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

ISSUE 4: Concrete Crack Filler

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Michael Shea – MT
Todd L. Bennett – CM
Bill Dunn - BR

Summary: Currently, MoDOT specifications do not include Concrete Crack Filler. The proposed changes will add specifications and requirements for Concrete Crack Filler. Bridge Division has worked with appropriate industry representatives to establish specifications and have experienced suitable performance over the last three years.

Fiscal Impact: There is no fiscal impact anticipated with these revisions.

Publication: Std. Secs 704 & 1053, EPG Articles 771 & 1053

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

ISSUE 5: Open Cell Foam Joint and Preformed Silicone or EPDM Expansion Joint Seal

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Bill Dunn – BR

Summary: The proposed revisions incorporate to new joint seals for bridge expansion joints into the Standard Specifications. The expansion joint seals have been used by Bridge JSP for some time, without significant issues. The original JSP was developed in cooperation with Industry and has provided satisfactory results.

Fiscal Impact: There is has been no fiscal impact with these revisions.

Publication: Std. Secs 717 & 1073, EPG Article 717

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

ISSUE 6: End Bent Vertical Drain

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Boyd Denson – BR
Rhonda Luck - BR

Summary: The proposed revisions will increase the drainage behind bents. The increased construction cost should be offset by lower maintenance costs. Improved drainage will decrease fill loss (less mud jacking) and decrease deterioration of reinforcement and steel piles (less substructure rehabilitation).

Fiscal Impact: There is a $95,000 per year total increase cost associated with this revision.

Publication: Bridge Standard Drawing – Vertical Drain

Actions:
- ☐ Approve
- ☐ Reject
- ☐ Discuss Further

_____ _____

signature *date*

127.9 Floodplain Management and the Regulatory Floodway

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127.9.1 Introduction

127.9.1.1 National Flood Insurance Program Requirements

Acting as the Federal Highway Administration's (FHWA's) agent, MoDOT must evaluate every project and determine whether it could have a negative impact on the base (1% or 100-year) floodplain and/or regulatory floodway. ~~The Federal Emergency Management Agency (FEMA) and Federal Highway Administration (FHWA)FHWA guidelines~~ 23 CFR 650 ~~identify~~ defined the base (1% or 100-year) flood as the flood having a one-percent probability of being equaled or exceeded in any given year. The base floodplain is the area of ~~100-year~~ 1% flood hazard within a county or community. The regulatory floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the ~~100-year~~1% flood discharge can be conveyed without increasing the base flood elevation more than a specified amount. FEMA has mandated that projects can cause no rise in the regulatory floodway and no more than a one-foot cumulative rise for all projects where the base (~~100-year~~1%) flood elevation is given.

A "No-Rise" Certification is signed and sealed by an engineer licensed to practice in Missouri that a project will cause no rise in the regulatory floodway of a given flooding source. This confirms that ~~T~~the project will not create any increase to the ~~100-year~~1% elevations on said flooding source at published cross-sections in the Flood Insurance Study for a given community and will not create any increase to the ~~100-year~~ 1% flood elevations at unpublished cross-sections in the vicinity of the proposed development.

127.9.1.2 Laws and Regulations

National Flood Insurance Act (42 U.S.C. 4001-4129 and 44 CFR 59-77) of 1968 provides previously unavailable flood insurance protection to property owners in flood-prone areas.

Executive Order 11988: Floodplain Management (DOT Order 5650.2, 23 CFR 771, 23 CFR 650, Subpart A) of 1977 seeks “to avoid to the extent possible the long and short-term adverse impacts associated with the occupation and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.”

National Environmental Policy Act (NEPA) of 1969.

127.9.2 Process

The district must complete and submit a Request for Environmental Services (RES) to the Design Division’s ~~environmental~~ Environmental ~~section~~Section. Upon receiving an RES from the district, the environmental specialist will ~~consult SEMA to~~ determine whether the community or county in which the project is located has been mapped by FEMA for floodplain and~~/or~~ floodways. If the community or county has not been mapped by FEMA, floodplain permitting is not required. ~~this~~ This is communicated to the district via the RES.~~, along with the fact that no permits from SEMA will be required.~~ If the community has been mapped,~~,~~ then the environmental specialist will identify the extent of encroachment, if any, into the ~~100-year floodplain and/or regulatory floodway~~1% floodplain and/or regulatory floodway, and whether the community or county participates in the ~~NFIP~~National Flood Insurance Program (NFIP). If there is to be an encroachment into the ~~regulatory floodway~~1% floodplain, MoDOT must obtain a floodplain development permit from SEMA. If there will also be an encroachment into the regulatory floodway, MoDOT must issue a "No-Rise" Certification as required by SEMA to obtain a floodplain development permit that is

needed for any encroachment into the ~~100-year~~1% floodplain.~~, regardless of whether it also takes place within the regulatory floodway. The environmental specialist will, via~~ As indicated in the RES response, the environmental specialist will communicate this information to the district, which will then take the appropriate steps, often in consultation with the Bridge Division, to obtain the necessary permits.

127.9.3 Project Development Milestones

127.9.3.1 ~~Initial Screening Stage~~Location/Conceptual Plans Stage

~~At the initial project screening stage if maps are available,~~When the district submits the Location/Conceptual Plans RES, the environmental specialist will identify whether the project ~~takes place~~is located in a county or community that participates in the NFIP and the extent of the encroachment, if any, into the 1% floodplain and/or the ~~regulatory floodway~~ regulatory floodway ~~and/or 100-year floodplain~~. If the project will encroach upon the 1% floodplain and/or the regulatory floodway, the environmental specialist will communicate this to the district via the RES response.

~~The district initiates this process by submitting an RES to the Design Division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

127.9.3.2 ~~Location/Conceptual Plan Stage~~Preliminary Plans Stage

~~At the location/conceptual plan stage~~When the district submits the Preliminary Plans RES, if floodplain impact was not ~~evaluated~~ previously evaluated, the environmental specialist will identify whether the project ~~takes place~~is located in a county or community that participates in the NFIP and ~~initialize a floodplain/floodway encroachment study for the project.~~ the extent of encroachment, if any, into the 1% floodplain and/or regulatory floodway. If the project will encroach upon the 1% floodplain and/or the regulatory floodway, the environmental specialist will communicate this to the district via the RES response.

~~The district initiates this process by submitting an RES to the design division. Any new findings pertinent to the project will be relayed to the district in the RES response.~~

127.9.3.3 ~~Preliminary Plans Stage~~Right of Way Plans Stage

~~At the preliminary plans stage~~When the district submits the Right of Way Plans RES, if floodplain impact was not previously evaluated, the environmental specialist will identify whether the project ~~takes place~~is located in a county or community that participates in the NFIP ~~and initialize a floodplain/floodway encroachment study for the project.~~ and the extent of the encroachment, if any, into the 1% floodplain and/or the regulatory floodway. If the project will encroach upon the 1% floodplain and/or the regulatory floodway, the environmental specialist will communicate this to the district via the RES response.

~~The district initiates this process by submitting an RES to the design division. Any new findings pertinent to the project will be relayed to the district in the RES response.~~

127.9.3.4 ~~Right of Way Plan Stage~~Final Design Plans Stage

~~At the right-of-way plan stage~~When the district submits the Final Design Plans Stage RES, ~~if~~ floodplain impact ~~was not~~should have previously been evaluated and any required floodplain development permits and “no-rise” certifications should already be obtained.~~,~~ If floodplain impact was overlooked and has not been evaluated or if there has been a change that may cause the project to encroach upon the 1% floodplain and/or regulatory floodway, the environmental specialist will identify whether the project ~~takes place~~ is located in a county or community that participates in the NFIP and ~~initialize a floodplain/floodway encroachment study for the project.~~ the extent of encroachment, if any, into the 1% floodplain and/or regulatory floodway. However, the project may be delayed since any required floodplain development permit and “no-rise” certification must be obtained before letting occurs.

~~The district initiates this process by submitting an RES to the design division. Any new findings pertinent to the project will be relayed to the district in the RES response.~~

127.9.3.5 ~~Final Design Stage~~Letting

Floodplain/Floodway impacts must be known prior to letting and any required floodplain development permits and "no-rise" certifications must have been obtained. The project may be delayed until these permits are received.

~~Floodplain impact should have been previously evaluated, as any required floodplain development permit and "No-Rise" Certification should be obtained before final~~

~~design stage. If floodplain impact was overlooked and has not been evaluated by the final design stage, the environmental specialist will initialize a floodplain/floodway encroachment study for the project. However, the project may be delayed since any required floodplain development permit and "no-rise" certification must be obtained before letting.~~

~~The district initiates this process by submitting an RES to the Design Division. Any new findings pertinent to the project will be relayed to the district in the RES response.~~

~~127.9.3.6 Letting~~

~~Floodplain impacts must be known prior to letting as any required floodplain development permit and "No-Rise" Certification must have been obtained prior to letting. The project may be delayed until these permits are received.~~

127.11 Farmland Conversion

Forms

AD-1006 Form~~Form AD-1006~~

SCS-CPA-106 Form~~Form SCS-CPA-106~~

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127.11.2 Project Development Milestones

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127.11.2.5 ~~Final Design Stage~~Letting

~~127.11.2.6 Letting~~

127.11.1 Introduction

127.11.1.1 Overview

The Farmland Protection Policy Act (FPPA) mandates that federal agencies consider the impact of their activities on farmland. The Natural Resources Conservation Service (NRCS) has published a rule for implementing this act. The FPPA applies to all federal projects (i.e., projects that are paid for with federal funding), which take any right of way or permanent easement.~~, including those classified as Categorical Exclusions (CE's) under terms of the National Environmental Policy Act (NEPA).~~ The FPPA requires that the Federal Highway Adminstration (FHWA) and ~~Missouri Department of Transportation (~~MoDOT~~)~~ ~~to evaluate every project and determine whether it could have a negative impact on farmland.~~ identify and take into account the adverse effects that projects have on the preservation of farmland, consider alternative actions, as appropriate, that could lessen adverse effects, and to ensure that programs and projects, to the extent practicable, are compatible with ~~S~~state and units of local governments, and private

programs and policies to protect farmland. Both the relative value of the soils present on the site and the impact ~~that~~ the project will have on the area relative to agricultural use are considered ~~for~~ when ~~that determination.~~ determining project impacts to farmland.

127.11.1.2 Laws, Regulations and Guidance

The Farmland Protection Policy Act ~~Farmland Protection Policy Act~~ (FPPA) (7 U.S.C. 658) of 1981 has as its purpose "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland."

FPPA (7 CFR 658) as amended at 59 Federal Register 31117 (June 17, 1994).

National Environmental Policy Act (NEPA) of 1969

Implementing the Final Rule of the Farmland Protection Policy Act for Highway Projects, FHWA (May 1989). Explains how to complete farmland impact analysis in National Environmental Policy Act (NEPA) documents (or for projects that do not require a NEPA document) to gain FHWA approval.

Supplemental guidance for Implementation of Farmland Protection Policy Act, FHWA Memorandum to Regions (January 23, 1985). Identifies two additional areas where FHWA guidance is necessary.

127.11.1.3 ~~Process~~Applicability

The FPPA governs impacts to farmland only. Farmland, according to the FPPA, is defined as prime farmland, unique farmland~~,~~ or farmland that is of state or local importance. These terms are further defined in 7 USC 4201(c)(1) and 7 CFR 658.2(a).

Land that is already in or committed to urban development or water storage does not qualify as farmland and is therefore not subject to the FPPA. As per 7 CFR 658.2(a), land that meets any one of the following criteria is considered already committed to urban development or water storage:

1. Land with a density of 30 structures or more per 40 acre area.
2. Land identified as an "urbanized area" (UA) on the Census Bureau Map.

3. Land mapped as an urban area using the tint-overprint on the USGS topographical maps.
4. Land shown as “urban-built-up” on the USDA Important Farmland Maps.
5. Land that receives a combined score of 160 points or less for the Land Evaluation (Part V) and Site Assessment (Part VI) criteria on the Farmland Conversion Impact Rating Form.

127.11.1.4 Process

Acting for FHWA, the MoDOT environmental specialist, in ~~conjunction~~ coordination with NRCS, completes either a AD-1006 Form ~~Form AD-1006~~ (for sites) or a SCS-CPA-106 Form ~~Form SCS-CPA-106~~ (for corridors) to evaluate farmland impact for every project that requires any right of way and/or permanent easement. For projects that require an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), the EA or Draft EIS must include a copy of the completed form. For projects classified as a Categorical Exclusion (CE), a copy of the completed form is retained in the environmental files to document the coordination with NRCS.

Land classified as an urbanized area (UA) or water storage is not subject to the FPPA and such land will not require further evaluation. ~~The FPPA considers land that is within city limits to be “committed to other uses” and such land needs no further evaluation. Regardless of location, however, the district must still submit the proposed project to the design division’s environmental section for review by means of a Request for Environmental Services (RES).~~ For areas that do not fit this definition, the environmental specialist completes Parts I and III of the appropriate Farmland Conversion Impact Rating Form with the total amounts of new right of way and/or permanent easement acreages as provided on the Request for Environmental Services (RES) submitted by the district. Once these sections are completed, the environmental specialist submits the form, along with the necessary supporting documentation, to the appropriate NRCS Resource Soil Scientist from one of the 4 NRCS Area Contacts in the state. The NRCS contact then completes Parts II, IV, and V of the form using soil survey data and returns the form to MoDOT to complete the remaining sections for determining the total score.

~~The environmental specialist completes Parts I and III of the Farmland Conversion Impact Rating form, using the materials the district provides. The total new right-of-way and easement acreages are essential. Once these sections are completed, the environmental specialist sends the form, along with the necessary supporting documentation such as maps, to the appropriate NRCS contact (NRCS divides the~~

~~state into five regions). The NRCS contact then completes Parts II, IV, and V of the form using soil survey data and returns it to MoDOT.~~

If the NRCS representative finds the project site does not contains prime, unique, statewide or local important farmland, the environmental specialist indicates this in the RES response to the dsitrict and~~that there is no farmland impact, the environmental specialist notes that in a memo to the district and~~ no further action is required.

If the NRCS representative finds that the project site contains prime and unique farmland, or farmland of statewide or local importance, then the environmental specialist completes Part VI, adding its point total to that of Park IV to achieve a cumulative point total for Part VII. If the cumulative point total does not exceed the 160-point threshold established by NRCS for the protection of farmland, it is noted in the RES response to the district and no further action is required.

~~If the NRCS representative finds that there is an impact to prime and unique farmland, or farmland of statewide or local importance, then the environmental specialist completes Part VI, adding its point total to that of Part IV to achieve a cumulative point total for Part VII. If the cumulative point total does not exceed the 160-point threshold established for farmland protection, that is noted in the appropriate memo and no further action is necessary.~~

Although many projects fall under the 160-point threshold, approximately five to 10 percent of projects result in ratings that exceed 160 points. In these cases, at least two alternative sites must be identified and considered for a project. If a suitable alternative site is found for a project and does not impact or has a reduced impact on prime, unique~~,~~ or statewide or local important farmland, the site must be seriously considered for the project. If alternative sites are determined unsuitable for the project, the environmental specialist, with assistance from the district, as needed, must identify why the sites are economically infeasible and/or logistically unreasonable. Once a site is chosen, the environmental specialist records the recommended site or alternative site at the bottom of Part VII with justification for the selection.

~~For the five to ten percent of ratings with a point total that exceeds 160 (occurs more commonly in the northern half of Missouri), the environmental specialist will note measures or alternatives that would reduce or avoid impacts. If the preferred alternative exceeds the threshold, the environmental specialist will discuss reasons why this alternative is preferred over others that would affect less farmland. The environmental specialist records the recommended site or alternate at the bottom of Part VII with justification for the selection.~~

127.11.2 Project Development Milestones

127.11.2.1 ~~Initial Screening Stage~~Location/Conceptual Plans Stage

Once the RES is submitted by the district at the Location/Conceptual Plans Stage~~At the initial project screening stage, if maps and right-of-way/easement information are available~~, the ~~MoDOT~~ environmental specialist will begin the review to determine if there will be impacts to/conversion of farmland. If new right of way and/or permanent easement acreages are available, the environmental specialist prepares the appropriate farmland impact rating form (detailed in EPG 127.11.1.3 Process) for the project. ~~prepares a farmland impact rating for the project. Details of the rating process have previously been described in this article (see EPG 127.11.1.3 Process).~~

~~The district initiates this process by submitting an RES to the design division; usually no additional information will be required from the district. Findings pertinent to the project will be relayed to the district in the RES response and are also documented in a memo to file.~~

127.11.2.2 ~~Location/Conceptual Plan Stage~~Preliminary Plans Stage

If impacts to/conversion of farmland has not yet been evaluated at the time the district submits the RES for preliminary plans~~,~~ and new right of way and/or permanent easement acreages are available, the environmental specialist will prepare the appropriate farmland impact rating form (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will provide the district with any new project related findings via the RES response and will discuss appropriate actions with the project manager if necessary.

~~At the location/conceptual plan stage, if farmland impact has not yet been evaluated and total, new right-of-way and easement acreages are available, the environmental specialist prepares a farmland impact rating (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will provide the district with any findings pertinent to the project in the RES response, memoranda to file, or through core team participation.~~

~~The district initiates this process by submitting an RES to the design division or for projects that require an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), the environmental specialist and the district will coordinate on when to begin this process. The district may be required to submit additional information about the project at this stage.~~

127.11.2.3 ~~Preliminary Plans Stage~~Right of Way Plans Stage

If impacts to/conversion of farmland has not yet been evaluated at the time the district submits the RES for right of way plans~~,~~ and new right of way and/or permanent easement acreages are available, the environmental specialist will prepare the appropriate farmland impact rating form (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will provide the district with any new project related findings via the RES response and will discuss appropriate actions with the project manager if necessary.

~~At the preliminary plans stage, if farmland impact has not yet been evaluated, the environmental specialist prepares a farmland impact rating (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will provide the district with any new project-related findings via the RES response and will discuss appropriate actions with the project manager.~~

~~The district initiates this process by submitting an RES to the design division.~~

127.11.2.4 ~~Right of Way Plan Stage~~Final Design Plans Stage

If impacts to/conversion of farmland has not yet been evaluated at the time the district submits the RES for the final design plans stage~~,~~ and new right of way and/or permanent easement acreages are available, the environmental specialist will prepare the appropriate farmland impact rating form (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will provide the district with any new project related findings via the RES response and will discuss appropriate actions with the project manager if necessary.

~~At the right-of-way plan stage, if farmland impact has not yet been evaluated, the environmental specialist prepares a farmland impact rating (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will relay any new project-related findings to the district in the RES response and will discuss appropriate actions with the project manager.~~

~~The district initiates this process by submitting an RES to the design division.~~

127.11.2.5 ~~Final Design Stage~~Letting

Letting cannot occur until the farmland impact evaluation is completed, if one was determined to be required. At this stage, if impacts to/conversion of farmland has not yet been evaluated, the environmental specialist will prepare the appropriate farmland impact rating form (detailed in EPG 127.11.1.3 Process) for the project. Once the results of the farmland impact ratings are known, the environmental specialist will communicate them to the district.

~~At final design stage, if farmland impact has not yet been evaluated, the environmental specialist prepares a farmland impact rating (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will relay any new project-related findings to the district in the RES response and will discuss appropriate actions with the project manager.~~

~~The district initiates this process by submitting an RES to the design division.~~

~~127.11.2.6 Letting~~

~~Letting cannot occur until the farmland impact evaluation is completed. At this stage, if farmland impact has not yet been evaluated, the environmental specialist will prepare a farmland impact rating (detailed in EPG 127.11.1.3 Process) for the project. The environmental specialist will communicate the results of the farmland impact rating to the district once they are known.~~

~~The district initiates this process by submitting an RES to the design division.~~

127.21 Federal Emergency Management Agency (FEMA) Flood Buyout Properties

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127.21.1 Introduction

127.21.1.1 Overview

The Flood Disaster Protection Act of 1973, as amended by the Disaster Relief and Emergency Assistance Act of 1988 (The Stafford Act), identified the use of disaster relief funds under Section 404 for the Hazard Mitigation Grant Program (HMGP), including the acquisition and relocation of flood damaged property. The Volkmer Bill further expanded the use of HMGP funds under Section 404 to “buyout” flood damaged property, which had been affected by the Great Flood of 1993.

The federal government, through the FEMA, administers the HMGP to purchase flood-prone properties, rather than repeatedly providing disaster relief after each flooding episode. The state liaison for FEMA, the Missouri State Emergency Management Agency (SEMA), finds and purchases flood-damaged properties. Although FEMA allows private ownership, SEMA only allows public ownership in

Missouri; therefore after purchase, the properties are owned by various local (city and county) public jurisdictions.

There are several thousand “flood-buyout” parcels throughout the state and there are numerous restrictions on these FEMA buyout properties. No structures or improvements may be erected on these properties unless they are open on all sides. The site shall be used only for open space purposes and shall stay in public ownership. These conditions and restrictions (among others), along with the right to enforce them, are deemed to be covenants running with the land in perpetuity and are binding on subsequent successors, grantees, or assigns.

The buyout property restrictions preclude development of the parcels, including placement of fill material or bridge piers; thus the deed restrictions are a constraint to building roads and bridges. Any decision involving these properties should take into consideration that two to three years is needed to obtain an exemption from FEMA to utilize these parcels. This exemption would likely be a permanent easement rather than a transfer of property.

127.21.1.2 Laws and Regulations

44 CFR 206.434(d)—codifies the Hazard Mitigation Grant Program.

Stafford Act, Section 404, 1988—created the Hazard Mitigation Grant Program.

Volkmer Bill, 1993—an amendment to the Stafford Act, it substantially increased funding to the Hazard Mitigation Grant Program.

National Environmental Policy Act (NEPA) of 1969.

127.21.1.3 Process

The district must complete and submit a Request for Environmental Services (RES) to the Design Division’s environmental section. Upon receiving an RES from the district, the environmental specialist will identify whether the project takes place in an area with FEMA buyout properties and the extent of encroachment. Avoidance is strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with help from the district, will begin coordination with the local government administrator as well as SEMA to obtain relief from the open space restriction. The SEMA will forward this request to FEMA’s regional office, then on to the FEMA Director’s office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed and allow construction to take place.

127.21.2 Project Development Milestones

127.21.2.1 ~~Initial Screening Stage~~Location/Conceptual Plans Stage

At the ~~initial project screening stage~~Location/Conceptual Plan Stage, the environmental specialist will identify whether the project takes place in an area with FEMA buyout properties and the extent of encroachment. Avoidance is strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with the help of the district, will begin coordination with the local ~~government~~ administrator, as well as SEMA, to obtain relief from the open space restriction. This request will be forwarded by SEMA to FEMA's regional office, then on to the FEMA Director's office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed to allow construction to take place. Because of the amount of time involved in processing FEMA buyout ~~land~~ property, pertinent information should be sent to the environmental specialist as soon as possible.

~~The district initiates this process by submitting an RES to the design division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

127.21.2.2 ~~Location/Conceptual Plan Stage~~ Preliminary Plans Stage

At the ~~location/conceptual plan stage~~Preliminary Plans Stage, the environmental specialist will identify whether the project takes place in an area with FEMA buyout properties, and the extent of encroachment. Avoidance will be strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with the help of the district, will begin coordination with the local administrator, as well as SEMA, to obtain relief from the open space restriction. This request will be forwarded by SEMA to FEMA's regional office, then on to the FEMA Director's office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed to allow construction to take place. Because of the amount of time involved in processing FEMA buyout ~~land~~property, pertinent information should be sent to the environmental specialist as soon as possible.

~~The district initiates this process by submitting an RES to the design division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

127.21.2.3 ~~Preliminary Plans Stage~~Right of Way Plans Stage

At the ~~preliminary plans stage~~Right of Way Plans Stage, the environmental specialist will identify whether the project takes place in an area with FEMA buyout properties, and the extent of encroachment. Avoidance is strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with the help of the district, will begin coordination with the local ~~government~~ administrator as well as SEMA, to obtain relief from the open space restriction. This request will be forwarded by SEMA to FEMA's regional office, then on to the FEMA Director's office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed to allow construction to take place. Because of the amount of time involved in processing FEMA buyout ~~land~~property, pertinent information should be sent to the environmental specialist as soon as possible.

~~The district initiates this process by submitting an RES to the design division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

~~127.21.2.4 Right of Way Plan Stage~~

~~At the right-of-way plan stage, the environmental specialist will identify whether the project takes place in an area with FEMA buyout properties, and the extent of encroachment. Avoidance is strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with the help of the district, will begin coordination with the local government administrator as well as SEMA to obtain relief from the open space restriction. This request will be forwarded by SEMA to FEMA's regional office, then on to the FEMA Director's office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed to allow construction to take place. Because of the amount of time involved in processing FEMA buyout land, pertinent information should be sent to the environmental specialist as soon as possible. Note that the property cannot be purchased or given a permanent easement until the issue is resolved.~~

~~The district initiates this process by submitting an RES to the design division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

127.21.2.~~5~~4 Final Design Stage

At the ~~final design stage,~~Final Design Stage, the ~~process for~~ FEMA buyout process must be nearing completion to avoid delays to letting the project since the property cannot be purchased or given a permanent easement until the issue is resolved. However, if unknown FEMA buyout property is discovered at this stage, the environmental specialist will identify the extent of encroachment. Avoidance ~~is~~ of flood buyout properties is strongly recommended. If the buyout property cannot be avoided, the environmental specialist, with the help of the district, will begin coordination with the local ~~government~~ administrator, as well as SEMA, to obtain relief from the open space restriction. This request will be forwarded by SEMA to FEMA's regional office, then on to the FEMA Director's office in Washington, D.C. The request may be granted subject to conditions. FEMA may then prepare the legal instruments to amend the deed to allow construction to take place.

~~The district initiates this process by submitting an RES to the design division. Any findings pertinent to the project will be relayed to the district in the RES response.~~

127.21.2.~~6~~5 Letting

Coordination between MoDOT, the local ~~government~~ administrator, and SEMA ~~to obtain relief from open space restrictions on FEMA buyout properties must begin well before letting~~must begin well before letting so there is time to obtain relief from open space restrictions on FEMA buyout properties. If this has not begun prior to letting, the project will experience significant delays until this coordination has been achieved. The affected buyout property cannot be purchased or given a permanent easement until FEMA prepares the legal instruments to amend the deed to allow construction to ~~take place~~occur.

623.30.3.3 Field Test. Prior to the start of the overlay operation, a test area of the complete overlay system shall be placed on the bridge deck in a contractor proposed location that is approved by the engineer. When multiple bridges are included in a project, a test area will be required on each bridge. The contractor may utilize one-half of the bridge deck or an area equal to one day's placement operation, whichever is smaller, as a field test. The degree of cleaning used on the test area shall be the minimum used on the remainder of the structure. The surface for the test overlay shall be prepared in accordance with the test method prescribed in ACI 503R - Appendix A of the ACI Manual of Concrete Practice to establish an approved cleaning practice. The approved cleaning practice shall remove all potentially detrimental material which may interfere with the bonding or curing of the overlay. Concrete shall be sound, with mortar soundly bonded to the coarse aggregate, with clean and open pores to be considered adequate for bond. All areas of asphalt and pavement markings shall be removed. Preparation of the surface shall produce a surface relief equal to International Concrete Repair Institute (ICRI) surface preparation level 6 or 7 or ASTM E 965 pavement macrotexture depth of 0.04 to 0.08 inch.

623.30.3.3.1 Visible moisture on the prepared deck at the time of placing the overlay will not be permitted. Moisture in the deck shall be checked by taping a plastic sheet to the deck for a minimum of 2 hours in accordance with ASTM D4263.

623.30.3.3.2 In addition to the above requirements, the cleaning practice shall provide an adhesion strength test result greater than 250 psi or a failure area into the base concrete that is greater than 50 percent of the test area. After the test area has cured for a minimum of 72 hours, adhesion shall be checked in accordance with ACI 503R. A test result will be the average of three tests on a sample area of the test patch. A minimum of three sample areas per test patch shall be tested. Successful test results will be required from each sample area.

623.30.3.3.3 If the test of a sample area fails to meet the above requirements due to a cohesive failure of the substrate concrete, the adhesive strength of the sample area will be considered acceptable.

623.30.3.3.4 Successful completion of the adhesion strength tests will be required before the full-scale overlay operation is to begin. All cleaning operations shall equal those used for the adhesion strength test areas, in both profile and cleanliness. If changes are made to the established cleaning practice, new adhesion strength testing shall be performed at the contractor's expense.

623.30.3.3.5 Test patches shall be installed with the same material, equipment, personnel, timing, sequence of operations and curing period that will be used for the installation of the overlay.

623.30.3.3.6 If the test fails, the contractor shall remove the material represented by the failed test patches and provide another test patch, at the contractor's expense, until satisfactory test results are obtained.

623.30.3.4 Surface Preparation. Before placement of the overlay, the entire deck surface shall be prepared by the cleaning practice established in the field adhesion strength tests in accordance with Sec 623.30.3.3, except that sand blasting will not be permitted.

623.30.3.4.1 If the engineer determines that the weather has changed significantly since the application of the field test patch, the contractor shall verify through adhesion strength tests that the practice is acceptable, at the contractor's expense.

623.30.3.4.2 No traffic of any kind shall be permitted on any portion of the deck which has

been shot blasted or on the overlay without approval from the engineer. The time between surface preparation and application of the first course shall not exceed 24 hours.

623.30.3.4.3 All patching and cleaning operations shall be inspected and approved prior to placing the overlay.

623.30.3.4.4 If the deck or intermediate course is contaminated by foreign material or water after initial cleaning, the contamination and any detrimentally affected overlay material shall be removed. Both courses shall be applied prior to opening the area to traffic.

623.30.3.5 Equipment. The contractor's equipment shall be as recommended by the epoxy manufacturer.

623.30.3.6 Epoxy Mixture. Mixing of epoxy components shall be in accordance with the manufacturer's recommendations, except that the use of a volumetric mixer will be required. When mineral fillers are specified, the mineral fillers shall be inert and non-settling or readily dispersible. Material showing a permanent increase in viscosity or the settling of pigments that cannot be readily dispersed with a paddle shall be replaced at the contractor's expense. At least 95 percent of the filler shall pass the No. 200 sieve.

623.30.3.7 Application. Application of epoxy shall be performed by the supplier or by a factory trained or licensed applicator with written approval from the manufacturer of the epoxy system.

623.30.3.7.1 The handling and mixing of epoxy shall be in accordance with the manufacturer's written recommendations. The overlay material shall not be placed when weather or surface conditions are such that the material cannot be properly handled, placed and cured within the specified requirements of traffic control, or when rain is forecasted within 24 hours of application.

623.30.3.7.2 The overlay shall consist of a two-course application of epoxy and aggregate. A prime coat shall be used if recommended by the manufacturer.~~The overlay shall consist of a thin prime coat and a two-course application of epoxy and aggregate. The first course shall be applied before the prime coat has gelled. The prime coat and first course shall not be placed as one application.~~ Each of the two courses shall consist of a layer of epoxy covered with a layer of aggregate in sufficient quantity to completely cover the epoxy. The thickness of each course shall be approximately equal. The total thickness of the overlay shall be no less than 1/4 inch.

623.30.3.7.3 The temperature of the bridge deck surface at the time of application shall be less than 90 F and in accordance with the manufacturer’s recommendation.

623.30.3.7.4 Dry aggregate shall be applied in such a manner as to cover the epoxy mixture completely within 5 minutes of application. The dry aggregate shall be placed in a manner such that the level of the epoxy mixture is not disturbed.

623.30.3.7.5 The first course shall be swept to remove loose aggregate prior to the second course application. Sweeping shall be done without removing embedded aggregate. First course applications which do not receive enough aggregate prior to gelling shall be removed and replaced. A second course applied with insufficient aggregate may be left in place, but additional applications shall be placed at the contractor’s expense before opening to traffic.

623.30.3.7.6 The thickness of the overlay shall be verified to be at least 1/4-inch, measured from the deck surface to the top of the resin. The contractor shall provide a minimum 1/2-inch diameter hole at a rate of at least one hole per 100 feet of traffic lane. Hole placement shall be at locations designated by the engineer. Thin areas shall be recoated and reverified at the

SECTION 627

CONTRACTOR SURVEYING AND STAKING

627.1 Description. This work shall consist of providing the necessary surveying and staking for the successful prosecution of the work.

627.2 Staking Requirements. Staking work shall be in accordance with general accepted surveying practices and provisions of the contract. The MoDOT's current Engineering Policy Guide (EPG), 238.4, may be used as guidance and is available on MoDOT's web site.

627.2.1 The contractor shall preserve all right of way monuments, benchmarks control points and reference marks set by the engineer. If any monumentation is damaged, destroyed or disturbed by the contractor, the cost of replacement will be at the contractor's expense and will be deducted from the payment for the work.

627.2.2 All surveying shall be documented by the contractor in a written form acceptable to the engineer. During performance of the work, all surveying documents shall be available and supplied to the engineer upon request, at the contractor's expense. All documents shall be labeled with the route, state job number, county, contractor name, survey party supervisor and date.

627.2.3 The engineer will furnish and set control points with known coordinates. The engineer will furnish all coordinate data to lay out the job and locate benchmarks as shown on the plans. The contractor shall provide all other staking necessary for the successful prosecution of the work~~.~~, including all staking necessary to facilitate the relocation of utilities. All alignment control established by the contractor shall be referenced, and a copy of the references shall be furnished to the engineer.

627.2.4 Any surveying or measurements necessary for computing pay quantities will be performed by the engineer. The contractor shall notify the engineer at least two working days prior to disturbing any areas used to calculate pay quantities.

627.2.5 All surveying work performed by the contractor shall be sufficient and accurate to construct the work in accordance with the contract documents. Any delays or additional costs to the project which result from insufficient or inaccurate staking or time lost for corrective action will be considered as a nonexcusable and noncompensable delay.

627.2.6 The construction centerline shown on the plans shall be accurately established and the control points of all curves shall be referenced. If it is necessary to introduce an equation in order to match the plan stationing or if a plan equation is changed, such changes will be at the written direction of the engineer.

627.2.7 Adjustments necessary to provide accurate staking or match improvements to existing features shall be immediately brought to the attention of the engineer. The engineer will determine the nature of the discrepancy and will make revisions as necessary. The contractor shall perform any restaking required by such revisions. Any reimbursement due to the contractor for additional staking due to design errors will be in accordance with Sec 109.4.3.

SECTION 704

CONCRETE MASONRY REPAIR

704.1 Description. This work shall consist of removing deteriorated concrete, preparing the repair site, forming where required, placing and finishing new concrete or qualified special mortar ~~and~~, applying epoxy and applying concrete crack filler in the required areas.

704.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows. The qualified special mortar shall be from the qualified rapid set concrete patching material listing available from Construction and Materials or MoDOT's web site.

Item	Section
Concrete	501
Concrete Bonding Compound and Epoxy Mortar	623
Gradation E Coarse Aggregate	1005
Type III Cement	1019
Type III Epoxy & Epoxy Polymer Concrete Overlay	1039
Concrete Crack Filler	1053
Water	1070

704.3 Types of Repair.

704.3.1 Repairing Concrete Deck (Half-Soling). This work shall consist of partial removal and replacement of bridge deck concrete in the required areas.

704.3.2 Deck Repair With Void Tube Replacement. This work shall consist of partial removal and replacement of bridge deck concrete and removal and replacement of the deteriorated void tube in the required areas.

704.3.3 Full Depth Repair. This work shall consist of complete removal and replacement of the bridge deck concrete in the required areas.

704.3.4 Modified Deck Repair. This work shall consist of the removal and replacement of visibly loose or spalled bridge deck concrete and placement of concrete in the areas where the reinforcing steel is exposed. The repair concrete for these areas shall be Class B-1.

704.3.5 Superstructure Repair (Unformed). This work shall consist of repairing the deteriorated concrete on the bottom of the bridge deck in the required areas with a qualified special mortar.

704.3.6 Slab Edge Repair. This work shall consist of repairing the edge of the bridge deck by removing deteriorated concrete and patching the required areas with a qualified special mortar. All repairs made within 4 inches of the edge of the bridge deck, regardless of the repair thickness, will be considered slab edge repair. Portions of the bridge deck areas requiring repair that extend more than 4 inches from the edge of the bridge deck shall be repaired as superstructure repair (unformed) or full depth repair.

704.3.7 Substructure Repair (Formed). This work shall consist of formed substructure repair. The required areas shall be patched with Class B-1 concrete. Coarse aggregate shall be Gradation E in accordance with Sec 1005.

704.3.8 Substructure Repair (Unformed). This work shall consist of unformed substructure repair. The required areas shall be patched with a qualified special mortar.

704.3.9 Epoxy Sealing. This work shall consist of applying an epoxy material to the concrete in the required areas.

704.3.10 Concrete Crack Filler. This work shall consist of applying a concrete crack filler to the concrete in the required areas.

704.4 Construction Requirements.

704.4.1 Removal Requirements. The type of repair and areas to be repaired will be outlined by the engineer. All loose, deteriorated and unsound concrete in the required repair areas shall be removed by conventional hand/mechanical, hydro demolition or other approved equipment to a depth as specified herein and as directed by the engineer. Slight deck imperfections surrounded by sound concrete shall be cleaned of all dirt, loose material and deteriorated concrete. If reinforcing steel is not exposed, deck repair work will not be required.

704.4.1.1 Bridge Decks to be Covered with Asphalt or Concrete Wearing Surface. The existing bridge deck shall be scarified for the concrete wearing surface as specified in the contract documents and in accordance with Sec 505. Slight bridge deck imperfections of 0.5 inch or less in depth below the prepared deck surface that are surrounded by sound concrete, and the reinforcing steel is not exposed, shall not be half-soled. These areas shall be cleaned by hand tools, sand or hydro blasting to remove all dirt, loose material and deteriorated concrete before the application of the asphalt or concrete wearing surface. Asphalt or concrete for these areas shall be placed monolithic with the wearing surface in accordance with Sec 403 or Sec 505.

704.4.1.2 Bridge Decks to be covered with Epoxy Polymer Concrete Overlay. Preparing and cleaning the existing bridge deck shall be in accordance with Sec 623.

704.4.1.3 Conventional Hand/Mechanical Equipment. Conventional hand/mechanical equipment consisting of jackhammers no heavier than the 35-pound class shall be used for concrete removal. For bridge decks rated 5 or below, the jackhammers shall not be heavier than the 65-pound class. Chipping hammers from the 15-pound class shall be used to remove concrete from beneath any reinforcing bars, where required. The bits shall be sharp in order to reduce pounding. Jackhammers shall be operated to minimize damage to the sound concrete around the patch area. Other methods that would be less damaging to the concrete and reinforcement may be used with approval from the engineer.

704.4.1.4 Patch Repair Hydro Demolition Equipment. The hydro demolition equipment shall be capable of removing concrete to the specified depth and shall be capable of removing rust and concrete particles from exposed reinforcing bars. All water used in hydro demolition shall be potable in accordance with Sec 1070. Stream or lake water will not be permitted. The contractor shall take necessary precautions during hydro demolition to prevent damage to the remaining structure and adjacent property as a result of runoff. Slab drains receiving runoff from the contractor's operation shall be temporarily plugged. The discharge water shall not be released from the site until the broken concrete, aggregate and other settleable solids have been removed through filtration, sediment basins or other approved methods. The contractor shall control dust and run-off in accordance with applicable governmental regulations. Environmental protection shall be in accordance with Sec 107. Hydro demolition shall not

bonding compound or an epoxy mortar prior to the placement of new concrete. A concrete bonding compound shall be used for all structures with the following exception. An epoxy mortar shall be used on box girder, voided and solid slab structures and on structures where a cathodic protection system is to be installed.

704.4.2.2 Epoxy Sealing Preparation. The area to be sealed shall be cleaned by sand blasting. Prior to sealing the concrete, all loose particles and foreign matter shall be removed using oil-free and water-free compressed air or a vacuum of at least 90 psi.

704.4.2.3 Concrete Crack Filler Preparation. The area to fill the cracks shall be cleaned by pressure washing with at least 2500 psi, 3 days minimum prior to the crack filler application and 2 days after any measurable precipitation.

704.4.3 Applying Epoxy. The area to be sealed shall be sealed with a qualified Type III epoxy or epoxy material for epoxy polymer concrete overlay. Sealing shall be completed before the application of any overlay. The cleaning, sealing and epoxy application shall proceed only as approved by the engineer, in accordance with the manufacturer's written recommendations. The epoxy application and rate of coverage shall be in accordance with manufacturer's recommendations, with a maximum coverage of 100 square feet per gallon.

704.4.3.1 Applying Concrete Crack Filler. The area to fill the cracks shall be filled with a low viscosity polymer crack filler. The concrete crack filler application and rate of coverage shall be in accordance with the manufacturer's recommendations, with a maximum coverage of 100 square feet per gallon. The broadcasting of dry blasting sand shall be applied only as approved by the engineer, in accordance with the manufacturer's written recommendations with a maximum coverage of 1 to 2 lbs/sq.yd. starting approximately 10 minutes after crack filling operation has started.

704.4.4 Placement of New Concrete.

704.4.4.1 Concrete Placement Requirements. Concrete shall be placed before the concrete bonding compound or epoxy mortar has begun to set. Deck repair concrete shall be placed in the repair area to match the top of the original deck surface. For bridges to be covered with concrete wearing surface, deck repair concrete shall be placed in the repair area up to the bottom of the proposed concrete wearing surface. The finished repair area shall have a light broom texture for bonding of the deck seal, except bridges to be covered with concrete wearing surface shall have a rough surface for bonding of the concrete wearing surface. All joints shall be formed to match any existing joint pattern.

704.4.4.2 Concrete Requirements. Concrete for concrete deck repair shall be Class B-2, except that solid slab, voided slab and box girder structures shall be the same class as the existing deck concrete and as specified in Secs 704.3.4 and 704.4.4.3. The repair area shall not be opened to any traffic until the concrete has reached a compressive strength of 3,200 psi. Type III cement may be used to accelerate the set. The coarse aggregate shall be Gradation E in accordance with Sec 1005. Accelerating additives containing chlorides will not be permitted.

704.4.4.3 Bridge Decks with Cathodic Protection System. Concrete for repairing the concrete deck shall be Class B-1. The repair area shall not be opened to any traffic until the concrete has reached a compressive strength of 3200 psi. Type III cement may be used to accelerate the set. The coarse aggregate shall be Gradation E in accordance with Sec 1005. Accelerating additives containing chlorides will not be permitted. All half-sole repairs made on the deck shall be Class B-1 concrete that has a maximum chloride ion content of 5 pounds per cubic yard. All full depth repairs made on the deck shall be chloride-free Class B-1 concrete from the bottom of the deck to within one inch of the lowest rebar of the top layer of

reinforcing steel. The remainder of the repair shall be Class B-1 concrete with a maximum chloride ion content of 5 pounds per cubic yard.

704.4.4.4 Curing. The repaired areas shall be cured in accordance with Sec 703. The cleaning and application of the epoxy polymer concrete overlay to the deck shall proceed only as approved by the engineer in accordance with the manufacturer's written recommendations.

704.5 Method of Measurement. The extent of repair may vary from the estimated quantities, but the contract unit price shall prevail regardless of the variation. Final measurement will not be made for preparation of the existing deck. No duplication of measurement will be made for full depth repair, repairing concrete deck (half-soling), deck repair with void tube replacement, slab edge repair, superstructure repair (unformed) or modified deck repair. No duplication of measurement will be made for substructure repair, unformed and formed.

704.5.1 Repairing concrete deck (half-soling), deck repair with void tube replacement, full depth repair, modified deck repair, superstructure repair (unformed) and substructure repair (formed and unformed) will be measured to the nearest square foot.

704.5.2 Slab edge repair will be measured to the nearest linear foot.

704.5.3 No measurement will be made for epoxy sealing.

704.5.4 Measurement of reinforcing steel replaced due to excess section loss will be made to the nearest 10 pounds.

704.5.5 Filling concrete cracks will be measured to the nearest square foot.

704.6 Basis of Payment. Accepted quantities of concrete masonry repairs will be paid for at the contract unit price for each of the pay items included in the contract. No direct payment will be made for epoxy sealing. Payment for accepted quantities of reinforcing steel replaced due to excess section loss will be paid for at the fixed contract unit price specified in Sec 109.15. No payment will be made for replacement of reinforcing steel cut or broken by the contractor.

SECTION 1053

CONCRETE SEALER AND CONCRETE CRACK FILLER

SECTION 1053.10 PENETRATING CONCRETE SEALER

1053.10.1 Scope. This specification covers concrete sealers for the protection of concrete against damage from de-icing chemicals.

1053.10.2 Acceptance. All material under this specification shall be obtained from a source identified on the PAL designated for this specification. All material under this specification will be inspected and accepted in accordance with Sec 106. ASTM and AASHTO specifications, when referenced, control only the physical and chemical properties of the material.

1053.10.3.~~1~~ The sealer shall be a alkyltrialkoxysilane, with low oligomer and polymer compound content. The chemical composition shall meet the following requirements:

Property	Specification
Purity	95% minimum monomer by weight
Solvent	Less than 5% by weight
Residue	Less than 2% by weight
Density	Per the manufacturer's recommendation
Flash Point	ASTM D93: greater than 125 degrees F
Dry Time	ASTM D1640 Sec 7.5.1: One hour or less

1053.10.3.1.~~1~~ The ASTM D1640 test shall be performed on a concrete surface. This concrete shall be a mix design called for in Sec 1053.10.3.2. The application rate shall be the same rate specified in Sec 703.

1053.10.3.2 The sealer shall meet the following performance criteria based on a single application at the application rate specified in Sec 703. MoDOT reserves the right to verify any qualification tests at their expense on any field application. Test specimens shall be produced using either the MoDOT Class B-2 concrete in accordance with Sec 501 or the concrete mix specified by the test being performed.

Test	Test Method	Duration	Max Absorption / Cl^-
Water Immersion	ASTM C642	48 hours	0.5 percent by weight (mass)
Water Immersion	ASTM C642	50 days	1.5 percent by weight (mass)
Salt Water Ponding (based on non-abraded specimen)	AASHTO T259	90 days	80% min reduction in Cl^- absorption & 0.50 lbs/cu yd Cl^- at a depth of 1/2" - 1" max

1053.10.3.3 The sealer shall not permanently stain, discolor or darken the concrete. Application of the sealer shall not alter the surface texture or form a coating on the concrete surfaces.

1053.10.3.4 The sealer shall not leave residue on glass, painted metal or automobiles.

1053.10.3.5 The sealer shall not reduce the bond of pavement markings or reduce the skid resistance of the surface being sealed. Any sealer determined to have these adverse effects will be removed from the pre-qualified list.

1053.10.3.6 The sealer shall be delivered to the project in unopened containers with the manufacturer's label identifying the product and with the seal(s) intact. Each container shall be clearly marked by the manufacturer with the following information:

(a) Manufacturer's name and address.

(b) Product name.

(c) Date of manufacture and expiration date.

(d) Lot identification.

(e) Storage requirements.

1053.10.4 Manufacturer and Brand Name Approval. Prior to approval and use of concrete sealers, the manufacturer shall submit to Construction and Materials a certified test report from an approved testing laboratory showing specific test results conforming to the requirements of these specifications. The certified test report shall also contain the manufacturer's name, product brand name, lot number and date of manufacture. Upon approval of the certified test report by the engineer the manufacturer and brand name will be added to the PAL designated for this specification. New certified test results shall be submitted any time the manufacturing process or the sealer formulation is changed, and may be required by the engineer when sampling and testing of material offered for use indicates nonconformance to any of the requirements herein specified.

SECTION 1053.20 CONCRETE CRACK FILLER

1053.20.1 Scope. This specification covers concrete crack fillers for the protection of concrete against damage from de-icing chemicals.

1053.20.2 Acceptance. All material shall be obtained from a source identified on the PAL designated for this specification, except as otherwise listed below. All materials under this specification will be inspected and accepted in accordance with Sec 106,

1053.20.3 Concrete Crack Filler.

1053.20.4 The concrete crack filler shall be a low viscosity polymer. The chemical composition shall meet the following requirements:

Property	Test Method	Specification
Viscosity	AASHTO D-2393	Less than or equal to 25 cps
Gel Time	AASHTO T-237	Less than or equal to 20 minutes @ 70 deg F
Tensile Strength	ASTM D638	Greater than or equal to 1500 psi
Elongation	ASTM D638	Greater than or equal to 5%
Solids Content		Greater than or equal to 95%
Flash Point	ASTM D1310	Greater than or equal to 50 deg F
Cure Rate	AASHTO T-237	Less than or equal to 3 hrs @ 70 deg F

1053.20.5 The concrete crack filler shall meet the procedures and the application rates as specified in Sec 704. MoDOT reserves the right to verify any qualification tests at their expense on any field application.

1053.20.6 Manufacturer and Brand Name Approval. Prior to approval and use of concrete crack fillers, the manufacturer shall submit to Construction and Materials a certified test report from an approved testing laboratory showing specific test results conforming to the requirements of these specifications. The certified test report shall also contain the manufacturer's name, product brand name, lot number and date of manufacture. Upon approval of the certified test report by the engineer the manufacturer and brand name will be added to the PAL designated for this specification. New certified test results shall be submitted any time the manufacturing process or the crack filler formulation is changed, and may be required by the engineer when sampling and testing of material offered for use indicates nonconformance to any of the requirements herein specified.

771.16 Penetrating Concrete Sealer - Silane

Code: R322

Silane surface treatment helps to seal bridge decks by creating a hydrophobic barrier that prevents the intrusion of water and chlorides into the bridge deck. The following conditions should be considered when applying silane:

- Silane should be applied to concrete bridge deck surfaces. Silane should not be applied to bituminous or epoxy sealed surfaces.
- Apply prior to use of crack fillers as it can increase adhesion and provide protection to concrete.
- The work should be performed with surface temperatures between 40°F and 90°F. Cooler temperatures will prevent loss of product due to evaporation, but increases cure time. Nighttime applications are encouraged during summer applications.
- Decks should be clean and dry prior to application. The presence of moisture will completely stop silane penetration.
- Remove any loose dirt immediately prior to the application of the product.
- Apply with a low-pressure, high-volume sprayer. Avoid application with hand pump sprayers.
- Apply at a rate of 200 sq. ft./gal. When applying product, be careful not to get overspray on vehicles. Allow product to penetrate the bridge deck and dry prior to opening to traffic.

Silane should be applied on all new concrete bridge decks. If additional cracking occurs, reapplication should be considered in the first 3 years. Additional applications are recommended at 7- to 10-year intervals.

Materials

Silane should be applied according to manufacturer's recommendations. See the Penetrating Concrete Sealer JSP and Sec 1053.10 for Specification.

Health, Environment and Guidance

Work crews should wear appropriate PPE and follow manufacturer's recommendations when applying. Runoff from crack sealing needs to be controlled to prevent contamination of waterways and property damage. Refer to MSDS additional information. See R322 Bridge Seal Coats Maintenance Planning Guidelines for additional information.

771.17 Concrete Crack Filler - Low Viscosity Polymer (LVP) ~~Bridge Deck Crack Filler~~

Code: R322

LVP bridge deck crack fillers seal bridge decks with hairline shrinkage cracks to prevent intrusion of water and chlorides into the bridge deck or overlay. The following conditions should be considered when applying polymer crack fillers.

- LVP crack fillers can be used for filling any size cracks. It is best used as needed for hairline cracks that are narrower than 1/128".
- The work should be performed in temperatures below 75°F. Applying the product in cooler weather allows better crack penetration.
- Decks should be cleaned and pressure washed (2500 psi minimum) and allowed to dry 3 days prior to polymer application and 2 days after any measureable precipitation.
- Cover expansion devices or other features that are not to be sealed over.
- Apply polymer at a rate of 100 sq. ft./gal. of deck surface.
- Use a squeegee or broom to spread polymer uniformly over bridge deck.
- Broadcast sand at a rate of 1 to 2 lbs./sq. yd. to treat deck surface prior to cure.

Reapplication should be considered as needed.

Materials

LVP should be applied according to manufacturer's recommendations. ~~See~~ Refer to Sec 1053.20 for ~~the LVP Bridge Deck Crack Filler GS~~ specification.

Health, Environment & Guidance

Work crews should wear appropriate PPE and follow manufacturer's recommendations when applying. Runoff from crack filling needs to be controlled to prevent contamination of waterways and property damage. Refer to MSDS additional information. See R322 Bridge Seal Coats Maintenance Planning Guidelines for additional information.

Category:1053 Concrete Sealer and Concrete Crack Filler

Form
GS-13 Form 3

This article establishes procedures for inspection, acceptance and reporting of concrete sealers for the protection of concrete against damage from deicing chemicals. Refer to Sec 1053 for MoDOT's specifications.

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- 1053.1.1 Pre-Acceptance Lists
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- 1053.1.4 Sampling

1053.2 Report (Records)

1053.1 Procedure

1053.1.1 Pre-Acceptance Lists

Manufacturers and Brand Names of concrete sealer will be placed on the Pre-Acceptance Lists maintained by the Central Office in accordance with Sec 106.

1053.1.2 Manufacturer and Brand Name Approval

If a manufacturer desires to have material added to the Pre-Acceptance List of concrete sealer, a certification and guarantee must be submitted to Construction and Materials in accordance with the requirements of Sec 1053. Upon approval of the material, it will be placed on the Pre- Acceptance List.

1053.1.3 Basis of Acceptance

The components may be accepted by certification. Certification for components shall declare the original source of the material and what material is being provided.

1053.1.4 Sampling

Sampling and Testing shall be in accordance with EPG 106.12 Pre-Acceptance Lists (PAL).

1053.2 Report (Records)

The manufacturer shall submit to Construction and Materials a certified test report from an approved testing laboratory showing specific test results in accordance with Sec 1053.

Material purchased for maintenance work may be accepted solely on the basis of the manufacturer and brand being on the Pre-Acceptance List or on label analysis, certification or detailed invoice for components. District materials will report the receipt and acceptance of the material in SiteManager and will mark the containers with the Sample ID number they assign.

SECTION 717

~~NEOPRENE AND SILICONE~~FLEXIBLE JOINT SYSTEMS

SECTION 717.10 PREFORMED COMPRESSION SEAL.

717.10.1 Description. This work shall consist of furnishing and installing a preformed compression seal for joints as shown on the plans or as directed by the engineer. Structural steel for the joints shall be furnished and installed as shown on the plans.

717.10.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Preformed Compression Seals	1073

717.10.3 Construction Requirements.

717.10.3.1 Shop Drawings. Shop drawings for structural steel for expansion devices shall be prepared in accordance with Sec 1080. The dimensions of the seal shall be shown on the shop drawings for the armored joint. Shop drawings will not be required when the seal is placed against concrete or existing armor steel.

717.10.3.2 Installation. The preformed compression seal shall be installed in joints in one continuous piece without field splices. Factory splicing will be permitted for joints in excess of 53 feet. The area of steel armor to come in contact with preformed compression seal lubricant adhesive shall be sand blasted prior to installing the seal. Sand blasting will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. The lubricant adhesive shall be applied in a continuous film to the sides of the seal and to the joint surfaces just prior to placing the seal in the joint. The seal shall be installed with an installation tool recommended by the manufacturer, in a manner that prevents the seal from being damaged and from being in tension. Twisting, curling and nicking the seal will be prohibited. Lubricant adhesive on top of the installed seal shall be removed before drying. Unless the installation tool is capable of installing the seal without elongation prior to placement, the seal shall be pre-cut to the exact length for the joint plus ends as shown in the contract documents. The pre-cut seal shall be installed and measured for stretch. The seal shall be removed and reinstalled if the seal stretch length exceeds five percent of the pre-cut length.

717.10.4 Method of Measurement. Final measurement will not be made except for authorized changes during construction or where significant errors are found in the contract quantity. Where required, the preformed compression seal will be measured to the nearest linear foot based on measurement from roadway face of curb to roadway face of curb along the centerline of the joint. The revision or correction will be computed and added to or deducted from the contract quantity. No measurement will be made of portions of the joint that extend past the roadway face of curbs.

717.10.5. Basis of Payment. Preformed compression seals, including all material, coating, equipment, labor, fabrication, installation and any other incidental work necessary to complete this work, will be paid for at the contract unit price.

SECTION 717.20 STRIP SEAL.

717.20.1 Description. This work shall consist of furnishing and installing a watertight strip seal for joints as shown on the plans or as directed by the engineer. The structural steel for the joints shall be furnished and installed as shown on the plans.

717.20.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Strip Seal	1073

717.20.3 Construction Requirements.

717.20.3.1 Shop Drawings. Shop drawings shall be prepared for the armored joint in accordance with Sec 1080. The drawings shall show in detail the type, size, location of anchors, and sequence of installation. The extrusion in the steel armor shall be of a dimensional tolerance that prevents the gland of the strip seal from slipping loose. The upper lip of the extrusion shall extend over the bottom lip to avoid pinching the gland when the expansion device is in a closed position. Shop drawings will not be required when the seal is placed in existing steel extrusions.

717.20.3.2 Installation. The area of steel armor to come in contact with strip seal lubricant adhesive shall be sand blasted prior to installing the seal. Sand blasting will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. The strip seal shall be made watertight with a lubricant adhesive for bonding the neoprene gland to the steel extrusion as recommended by the manufacturer. The contractor shall obtain the services of a qualified technical representative, approved by the manufacturer of the expansion system and acceptable to the engineer, to assist during the installation. The installation shall not occur without the technical representative being present.

717.20.4 Method of Measurement. Final measurement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Where required, the strip seal will be measured to the nearest linear foot, based on measurement from the roadway face of curb to roadway face of curb along the centerline of the joint. The revision or correction will be computed and added to or deducted from the contract quantity. Portions of the joint that extend past the roadway face of curbs will not be measured for payment. ~~The revision or correction will be computed and added to or deducted from the contract quantity.~~

717.20.5. Basis of Payment. Strip seals, including all material, coating, equipment, labor, fabrication, installation, technical assistance, and any other incidental work necessary to complete this work, will be paid for at the contract unit price.

SECTION 717.30 SILICONE EXPANSION JOINT SEALANT.

717.30.1 Description. This work shall consist of furnishing and installing the backer rod and silicone expansion joint sealant for joints as shown on the plans or as directed by the engineer. Structural steel for the joints shall be furnished and installed as shown on the plans.

717.30.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section

717.40.4 Method of Measurement. No measurements will be made.

717.40.5 Basis of Payment. No direct payment will be made for this work.

SECTION 717.50 OPEN CELL FOAM JOINT.

717.50.1 Description. This work shall consist of furnishing and installing an open cell foam joint system as shown on the plans, as directed by the engineer and in accordance with the manufacturer's requirements.

717.50.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Open Cell Foam Joints	1073

717.50.3 Construction Requirements. The contractor shall have a manufacturer's representative on site for the joint installation. The representative shall be responsible for ensuring the surface preparation and joint installation are done in accordance with the manufacturer's requirements.

717.50.3.1 Field Splices. The Open Cell Foam shall be installed in one continuous piece without field splices, unless otherwise specified on the plans or directed to by the engineer. Open Cell Foam shall be spliced with silicone called for in Sec 1057 and in accordance with the manufacturers recommendations.

717.50.4 Method of Measurement. Final measurement will not be made except for authorized changes during construction or where significant errors are found in the contract quantity. Where required, the open cell foam joint will be measured to the nearest linear foot based on measurement from roadway face of curb to roadway face of curb along the centerline of the joint. The revision or correction will be computed and added to or deducted from the contract quantity. No measurement will be made of portions of the joint that extend past the roadway face of curbs.

717.50.5. Basis of Payment. Open cell foam joint, including all material, coating, equipment, labor, fabrication, installation and any other incidental work necessary to complete this work, will be paid for at the contract unit price for Open Cell Foam Joint.

SECTION 717.60 PREFORMED SILICONE OR EPDM EXPANSION JOINTS.

717.60.1 Description. This work shall consist of furnishing and installing a preformed silicone or EPDM expansion joint seal for joints as shown on the plans or as directed by the engineer and in accordance with the manufacturer's requirements.

717.60.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Preformed Silicone or EPDM Expansion Joints	1073

717.60.3 Construction Requirements. The contractor shall furnish to the engineer the manufacturer's written product information, installation procedures and instructional information at least two weeks prior to installation. The contractor shall obtain the services of

a qualified technical representative approved by the manufacturer of the expansion joint seal and acceptable to the engineer, to assist during the installation. The contractor, the technical representative and the engineer shall meet to review and clarify installation procedures and requirements prior to starting the work. The start of surface preparations and seal installation shall not occur without the technical representative being present. The technical representative shall be present for at least one day at the start of surface preparations and seal installation.

717.60.3.1 Surface Preparation. The concrete or steel surface shall be prepared for priming and seal placement. New Portland cement concrete shall be fully cured and allowed to dry a minimum of seven days. The joint shall be cleaned of all gravel, loose material and other contaminates before sand blasting. Areas that will be in contact with the sealant shall be sand blasted with a clean, hard aggregate that will leave little to no dust residue. Sand blasted concrete surfaces will be considered acceptable when areas that will be in contact with the sealant have a roughened surface with clean, exposed aggregate. The surface shall be free of foreign matter or plastic residue. Sand blasted steel surfaces will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. After sand blasting is completed, the joint shall be cleaned of debris using oil-free and water-free compressed air or a vacuum, either being at least 90 psi. Using a rag saturated in denatured alcohol, wipe clean both vertical faces of the expansion joint opening.

717.60.3.2 Priming. Priming shall immediately follow sand blasting and cleaning and will only be permitted to proceed when the air and substrate temperatures are at least 40° F and rising. Sand blasting, priming and installing the seal shall be performed on the same day. The entire sand blasted surface shall be primed. Application and drying times for primers shall be in accordance with the manufacturer's recommendations. All leftover primer shall be properly disposed.

717.60.3.3 Installation. The preformed silicone or EPDM expansion joint seal shall be installed in joints in one continuous piece without field splices. The locking adhesive and seal shall be applied in accordance with the manufacturer's recommendations, in a manner that prevents the seal from being damaged and from being in tension. Twisting, curling and nicking the seal will be prohibited. Unless the installation tool is capable of installing the seal without elongation prior to placement, the seal shall be pre-cut to the exact length for the joint plus ends as shown in the contract documents or as directed by the engineer. The pre-cut seal shall be installed and measured for stretch. The seal shall be removed and reinstalled if the seal stretch length exceeds five percent of the pre-cut length at the contractor's expense.

717.60.4 Method of Measurement. Final measurement will not be made except for authorized changes during construction or where significant errors are found in the contract quantity. Where required, the preformed silicone or EPDM expansion joint will be measured to the nearest linear foot based on measurement from roadway face of curb to roadway face of curb along the centerline of the joint. The revision or correction will be computed and added to or deducted from the contract quantity. No measurement will be made of portions of the joint that extend past the roadway face of curbs.

717.60.5. Basis of Payment. Preformed silicone or EPDM expansion joint, including all material, coating, equipment, labor, fabrication, installation and any other incidental work necessary to complete this work, will be paid for at the contract unit price for Preformed Silicone or EPDM Expansion Joint.

1073.5.2 Material for Corrugation Areas of Stay-In-Place Forms. Expanded polystyrene material shall be in accordance with the following:

Property	Test	Requirement
Compression Strength	ASTM D 1621	10 psi, min.
Water Absorption	ASTM D 2842	2% by volume, max.

1073.5.3 Adhesive for Expanded or Extruded Polystyrene Materials. Adhesive for use with expanded or extruded polystyrene material shall be in accordance with the polystyrene manufacturer's recommendations.

1073.6 Open Cell Foam Joint System. All components of the system shall be supplied by one manufacturer. The joint system shall be comprised of the following components.

(a) Cellular polyurethane foam impregnated with 100% hydrophobic polymer, water based emulsion and factory coated, on the roadway surface, with highway-grade, fuel resistant silicone.

(b) Field-applied epoxy adhesive primer.

(c) Field-applied silicone sealant bands that seal the gap between the edge of the bridge and the silicone topping on the joint. This silicone will also be used for locking field splices in the joint together.

1073.6.1 General Movement Requirements. The seal shall have a working range of 50% in tension and 50% in compression. Changes in plane and direction shall be executed using factory fabricated watertight transition assemblies conforming to the plans and specifications.

1073.6.2 Seal Properties. The seal shall be able to meet the following properties:

Property	Requirement
Temperature Service Range, ASTM C 711	-40° F to 185° F
Bleeding	None at 180° F @ 50% compression for 3 hrs
UV Resistance, ASTM G 155	No Changes at 2000 hrs
Polymer impregnation agent	Free of any waxes or asphalts

1073.6.3 Adhesive Properties. The epoxy adhesive shall be a 100% solids, two component moisture sensitive modified epoxy adhesive which meets ASTM C 881.

1073.6.4 Sealant Properties. The silicone sealant shall be a one part, cold applied chemically curing silicone joint sealant which meets ASTM D 5893.

1073.7 Preformed Silicone or EPDM Joints. All components, materials and equipment required for the installation shall be obtained through an approved supplier of the system. All components of each respective joint system shall come from the same manufacturer and cannot be substitutes for others.

1073.7.1 Joint Properties. The joint material shall meet or exceed the following physical requirements:

Property	Specification	Requirement
Durometer (Shore A)	ASTM D 2240	55 ±5 min.

Property	Specification	Requirement
Tensile Strength	ASTM D 412	550 psi min.
Elongation	ASTM D 412	350% min.
Tear Strength (Die B)	ASTM D 624	100 ppi min.
Compression Set At 350° F 22 hrs	ASTM D 395	30% max.
Operating Temperature Range		-60° F to 350° F
Specific Gravity		1.51 ±0.10

1073.7.1.1 The joint seal shall be pre-qualified by undergoing and passing a cyclic loading test. Any rips, tears or bond failure will be cause for rejection. Manufacturer shall provide documentation to verify testing meeting these minimum requirements.

Cyclic Loading Test	
Property	**Requirement**
Test Sample Length	2 feet min.
Joint Skew	45°
Number of Cycles	200 min.
Joint Opening	2 inches
Movement	Min. to Max Opening
Temperature	-20° F

1073.7.2 Epoxy Primer. Epoxy primer shall be used to ensure the appropriate bond of the joint sealing system and to protect the surfaces of the joint after installation of the seal. The epoxy primer shall meet the following physical requirements:

Epoxy Primer		
Property	**Specification**	**Requirement**
Viscosity (centipoises)	ASTM D 2196	44
Solids	ASTM D 4209	41
Specific Gravity	ASTM D 1217	0.92
Flashpoint	ASTM D 56	48
VOC	ASTM D 3960	520

1073.7.3 Locking Adhesive. The adhesive material shall cure quickly and shall be as recommended by the manufacturer. The material shall adhere to concrete, elastomeric concrete, polymer concrete and steel and shall meet the following physical requirements:

Locking Adhesive		
Property	**Specification**	**Requirement**
Sag/Flow	ASTM C 639	3/16 inch max.
Hardness	ASTM C 661	20-30

Locking Adhesive		
Property	**Specification**	**Requirement**
Tack Free Time	ASTM C 679	30 minute max.
Cure Through To ¼ inch thickness	At 75°F/50% Relative Humidity	24 hours max.
Skin over time (Tooling Time)	At 75°F/50% Relative Humidity	5 minute max.
Resistance to U.V.	ASTM C 793	No cracking, Ozone Chalking or Degradation
Tensile Strength	ASTM D 412	200 psi min.
Elongation	ASTM D 412	450% min.

1073.~~6~~ 8 Documentation. Prior to approval and use of this material, the manufacturer shall submit to Construction and Materials a certified test report showing specific test results in accordance with all requirements of these specifications. The certified test report shall contain the manufacturer's name, brand name of material, lot tested and date of manufacture. In addition, the manufacturer shall submit a sample of the seal or polystyrene material and a one-pint sample of the adhesive for laboratory testing, accompanied by a technical data sheet and an MSDS. With approval by the engineer of the certified test report and satisfactory results of tests performed on the sample submitted, the brand name and manufacturer will be placed on the appropriate pre-acceptance list. Pre-acceptance lists are available through Construction and Materials or MoDOT's web site. New certified test results and samples shall be submitted any time the manufacturing process or the material formulation is changed, and may be required when random sampling and testing of material offered for use indicates nonconformity with any of the requirements herein specified.

Category:717 ~~Neoprene and Silicone~~Flexible Joint Systems

No additional Construction, Materials or Laboratory Testing guidance. Refer to Standard Specification 717.

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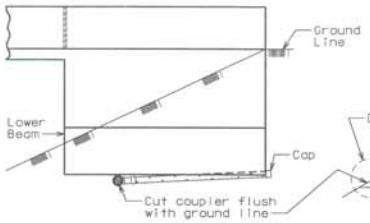
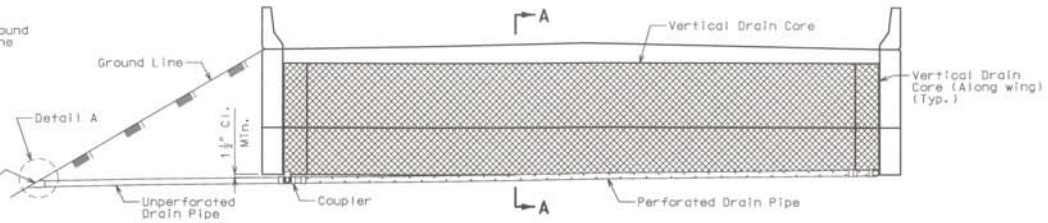
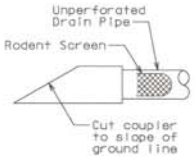


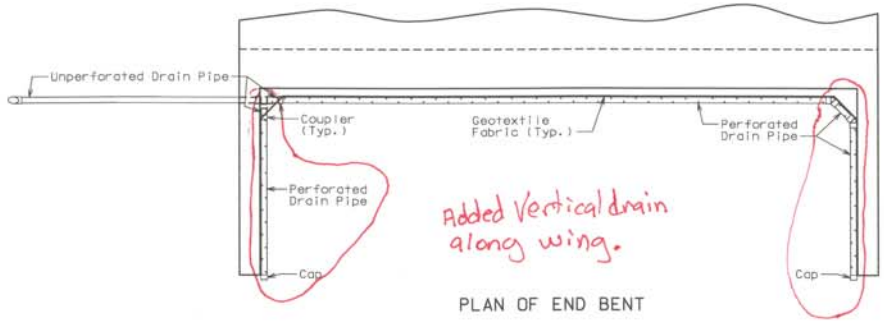
ELEVATION OF WING



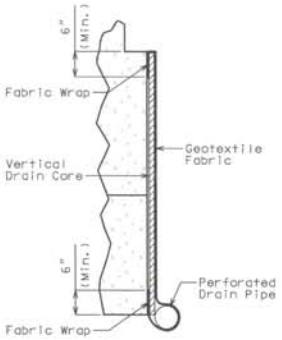
ELEVATION OF END BENT



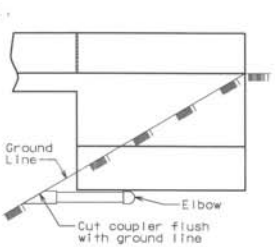
DETAIL A



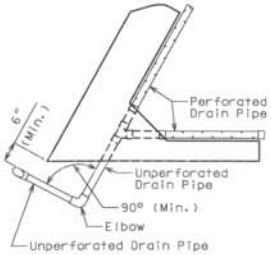
PLAN OF END BENT



PART SECTION A-A
(Section thru wing similar)



ELEVATION OF WING



PART PLAN

OPTIONAL TURNED DRAIN
(Only if rock is encountered outside of wing)

Standard Drawing Guidance
(do not show on plans):

Remove details that do not apply.

Revising for skewed end bent is not necessary nor required unless unusual details of drainage need to be shown.

For end bents with intermediate wing, see Bridge Standard Drawings sheet DRAIN03.

If the drain pipe discharges onto soil, front or side slope (item 3 and 4 of Standard Plan 609.20), and discharges a greater than 20 feet above the toe of slope, then the possible erosion of the slope should be considered and prevention coordinated with the district.

Possible solutions:

A. Provide a drain flume consistent with 609.40.

B. Extend the drain to the toe of slope using the following note (or similar) added to the general notes:

The unperforated drain pipe shall be extended parallel to the slope at a depth of 30 inches until the drain discharges onto rock blanket or the stream flowline.

C. Add a detail showing the drain extension.

General Notes:

All drain pipe shall be sloped 1 to 2 percent.

Drain pipe may be either 6-inch diameter corrugated metallic-coated steel pipe underdrain, 4-inch diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4-inch diameter corrugated polyethylene (PE) drain pipe.

Drain pipe shall be placed at fill face of end bent and inside face of wings. The pipe shall slope to lowest grade of ground line, also missing the lower beam of end bent by a minimum of 1 1/2 inches.

Perforated pipe shall be placed at fill face side and inside face of wings at the bottom of end bent and plain pipe shall be used where the vertical drain ends to the exit at ground line.

VERTICAL DRAIN AT END BENTS
(Squared end bent shown, skewed end bent similar)

Detailed
Checked

Note: This drawing is not to scale. Follow dimensions. Sheet No. of

"THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT."

DATE PREPARED	8/18/2016
ROUTE	*
STATE	MO
DISTRICT	BR
SHEET NO.	*
COUNTY	*
JOB NO.	*
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	DRAIN01

DATE	DESCRIPTION

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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