

MAINTENANCE PLANNING GUIDELINES	2006
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ACTIVITY: Drainage (R316) <p style="text-align: center;">MAJOR & MINOR</p>	ACTION: Clean & Reshape Ditches <i>A. Earth Ditches</i>
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DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.

PURPOSE: To keep the roadbed dry and maintain stability and proper drainage while keeping culvert pipes open.

SCHEDULING: As needed.	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> <tr> <td>A</td><td>E</td><td>A</td><td>P</td><td>A</td><td>U</td><td>U</td><td>U</td><td>E</td><td>C</td><td>O</td><td>E</td> </tr> <tr> <td>N</td><td>B</td><td>R</td><td>R</td><td>Y</td><td>N</td><td>L</td><td>G</td><td>P</td><td>T</td><td>V</td><td>C</td> </tr> <tr style="background-color: black;"> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>	J	F	M	A	M	J	J	A	S	O	N	D	A	E	A	P	A	U	U	U	E	C	O	E	N	B	R	R	Y	N	L	G	P	T	V	C												
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RECOMMENDED EQUIPMENT: <ul style="list-style-type: none"> • Motor Grader • Loader • Backhoe, Excavator, or Dragline • Dump Trucks • Broadcast Spreader • Eye Level &/or Transit • Traffic Control Equipment; (See EPG 616.23 Traffic Control for Field Operations) 	RECOMMENDED PROCEDURE: <ol style="list-style-type: none"> 1. Call Dig Rite and check for MoDOT utilities. 2. Place traffic control devices as needed. 3. Shape ditch and remove material as needed. 4. Clean loose material from roadway. 5. Set up erosion control as necessary. 6. Seed and mulch as necessary. 7. Remove traffic control devices.
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RECOMMENDED MATERIAL: <ul style="list-style-type: none"> • Seed • Mulch • Silt Fence, Straw Bales, Rock (for Berms), Triangular Silt Dyke, Coir Fiber Logs • Sod • Erosion Control Blankets 	
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SAFETY: Call before you dig to locate utilities (**1- 800-DIG-RITE**). Watch for traffic when operating equipment on the roadway. Wear all appropriate PPE. Refer to the [Safety Policies, Rules & Regulations – Employee Handbook](#).

OTHER CONSIDERATIONS: When excavating in lawn areas, adjacent property owners should be contacted prior to beginning work, if possible, to explain intent of operation.

REFERENCES: Missouri Standard Specifications for Highway Construction Sections [802](#), [803](#), [805](#), [806](#). Missouri Standard Plans, [806.10](#).

R316 – Clean & Reshape Earth Ditches (A. Earth Ditches)



(1) Downstream Culvert Ditch (Silted In)



(2) Digging out Culvert Ditch



(3) Digging out Culvert Ditch



(4) Digging out Culvert Ditch



(5) Graded Culvert Ditch



(6) Mulched & Seeded Ditch – Finished Product

MAINTENANCE PLANNING GUIDELINES

2006

ACTIVITY: Drainage (R316)

ACTION: Clean & Reshape Ditches
B. Paved Ditches

MAJOR & MINOR

DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.

PURPOSE: To fill voids and realign settled sections of paved ditch.

SCHEDULING: As needed when the temperature is above freezing.

J	F	M	A	M	J	J	A	S	O	N	D
A	E	A	P	A	U	U	U	E	C	O	E
N	B	R	R	Y	N	L	G	P	T	V	C

RECOMMENDED EQUIPMENT:

- Dump Trucks
- Water Truck
- Mudjack
- Air Compressor
- Pavement Drill
- Traffic Control Equipment;
(See EPG [616.23 Traffic Control for Field Operations](#))

RECOMMENDED PROCEDURE:

1. Call Dig Rite and check for MoDOT utilities.
2. Place traffic control devices as needed.
3. Wet paved ditch.
4. Pump and plug predrilled holes. Begin pumping at low end of section.
5. Clean work area and equipment.
6. Remove traffic control devices.

RECOMMENDED MATERIAL:

- Water
- Portland Cement
- Agricultural Lime

SAFETY: Call before you dig to locate utilities (**1- 800-DIG-RITE**). Watch for traffic when operating equipment on the roadway. Wear all appropriate PPE. Refer to the [Safety Policies, Rules & Regulations – Employee Handbook](#).

OTHER CONSIDERATIONS: Production can be increased by drilling in advance.

REFERENCES: Missouri Standard Specifications for Highway Construction Section; [609.10](#).

MAINTENANCE PLANNING GUIDELINES

2006

ACTIVITY: Drainage (R316)

ACTION: Repair Paved Ditches & Slopes

MAJOR & MINOR

DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.

PURPOSE: To maintain drainage by the repair of broken or settled sections of paved ditches, slopes and related drain basins.

SCHEDULING: Schedule when sections cannot be repaired by mudjacking or backfilling, when temperature is above freezing.

J	F	M	A	M	J	J	A	S	O	N	D
A	E	A	P	A	U	U	U	E	C	O	E
N	B	R	R	Y	N	L	G	P	T	V	C

RECOMMENDED EQUIPMENT:

- Compressor/Breakers
- Loader or Backhoe
- Backhoe Mounted Stinger
- Trucks
- Traffic Control Equipment;
(See EPG 616.23 [Traffic Control for Field Operations](#)).

RECOMMENDED PROCEDURE:

1. Call Dig Rite and check for MoDOT utilities, if digging or earthwork is involved.
2. Place traffic control devices as needed.
3. Break settled or damaged sections, and fill and shape damaged sections with clean shotrock.
4. Pour grout mix into shotrock and shape surface.
5. Drain basins should be repaired by removing damaged sections, forming and pouring new concrete to match existing grades.
6. Remove traffic control devices.

RECOMMENDED MATERIAL:

- Ready-Mix Concrete
- Shotrock
- Seed
- Mulch
- Silt Fence, Straw Bales, Rock (for Berms), Triangular Silt Dyke, Coir Fiber Logs
- Sod
- Erosion Control Blankets

NOTE: Other alternative methods for repairing paved ditches and slopes are becoming available, please see attached pictures.

SAFETY: Call before you dig to locate utilities (**1- 800-DIG-RITE**). Watch for traffic when operating equipment on the roadway. Wear all appropriate PPE. Refer to the [Safety Policies, Rules & Regulations – Employee Handbook](#).

OTHER CONSIDERATIONS: N/A

REFERENCES: Missouri Standard Specifications for Highway Construction Section; [609.10](#), [802](#), [803](#), [805](#), [806](#). Missouri Standard Plans, [806.10](#).

MAINTENANCE PLANNING GUIDELINES		2006																																																
ACTIVITY: Drainage (R316) <p style="text-align: center;">MAJOR & MINOR</p>	ACTION: Repair Curbing <i>A. Concrete Curbs</i>																																																	
DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.																																																		
PURPOSE: To restore drainage by repairing concrete curbs, islands, curb and gutters, and curbed medians.																																																		
SCHEDULING: As needed when the air and ground temperatures are above 45°F.	<table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> <tr> <td>A</td><td>E</td><td>A</td><td>P</td><td>A</td><td>U</td><td>U</td><td>U</td><td>E</td><td>C</td><td>O</td><td>E</td> </tr> <tr> <td>N</td><td>B</td><td>R</td><td>R</td><td>Y</td><td>N</td><td>L</td><td>G</td><td>P</td><td>T</td><td>V</td><td>C</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>		J	F	M	A	M	J	J	A	S	O	N	D	A	E	A	P	A	U	U	U	E	C	O	E	N	B	R	R	Y	N	L	G	P	T	V	C												
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RECOMMENDED EQUIPMENT: <ul style="list-style-type: none"> • Trucks • Concrete Mixer or Concrete Mobile • Concrete Curb Machine • Concrete Saw • Compressor/Breaker • Water Tank • Traffic Control Equipment; (See EPG 616.23 Traffic Control for Field Operations) 	RECOMMENDED PROCEDURE: <ol style="list-style-type: none"> 1. Place traffic control devices as needed. 2. Saw exterior limits of damaged section. 3. Remove damaged concrete, form, install steel, and place expansion felt at each transverse joint. 4. Pour concrete, finish, and apply curing compound. 5. When cured, remove forms, backfill, and seed. 6. Clean work area. 7. Remove traffic control devices. 																																																	
RECOMMENDED MATERIAL: <ul style="list-style-type: none"> • Concrete • Reinforcing Steel • Form Material • Expansion Felts • Grates • Water • Seed • Curing Compound 																																																		
SAFETY: Be careful when working near traffic. Wear all appropriate PPE. Refer to the Safety Policies, Rules & Regulations – Employee Handbook .																																																		
OTHER CONSIDERATIONS: N/A																																																		
REFERENCES: Missouri Standard Specifications for Highway Construction Section; 609.10 .																																																		

MAINTENANCE PLANNING GUIDELINES

2006

ACTIVITY: Drainage (R316)

ACTION: Repair Curbing
B. Asphalt Curbs

MAJOR & MINOR

DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.

PURPOSE: To restore drainage by repairing asphalt curbs, islands, and medians.

SCHEDULING: As needed when the air and ground temperatures are above 60°F.

J	F	M	A	M	J	J	A	S	O	N	D
A	E	A	P	A	U	U	U	E	C	O	E
N	B	R	R	Y	N	L	G	P	T	V	C

RECOMMENDED EQUIPMENT:

- Trucks
- Air Compressor/Asphalt Bit
- Asphalt Curb Machine
- Distributor
- Traffic Control Equipment;
(See EPG [616.23 Traffic Control for Field Operations](#))

RECOMMENDED PROCEDURE:

1. Place traffic control devices as needed.
2. Remove damaged material, tack, repair, and compact area.
3. Backfill and seed as necessary.
4. Remove traffic control devices.

RECOMMENDED MATERIAL:

- Hot Mix
- Liquid Asphalt (Tacking Grade)
- Seed

SAFETY: Be careful when working near traffic. Wear all appropriate PPE. Refer to the [Safety Policies, Rules & Regulations – Employee Handbook](#).

OTHER CONSIDERATIONS: N/A

REFERENCES: Missouri Standard Specifications for Highway Construction Section; [609.3](#).

MAINTENANCE PLANNING GUIDELINES

2006

ACTIVITY: Drainage (R316)

ACTION: Repair Curbing
C. Drop Inlets & Storm Sewers

MAJOR & MINOR

DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.

PURPOSE: To restore drainage by repairing inlet grates, broken inlets, and storm sewers.

SCHEDULING: Loose inlet grates should be scheduled as soon as detected. Other repairs as needed when the air and ground temperatures are above 45°F.

J	F	M	A	M	J	J	A	S	O	N	D
A	E	A	P	A	U	U	U	E	C	O	E
N	B	R	R	Y	N	L	G	P	T	V	C

RECOMMENDED EQUIPMENT:

- Truck
- Water Tank
- Compressor/Breaker
- Concrete Saw
- Traffic Control Equipment;
(See [EPG 616.23 Traffic Control for Field Operations](#)).

RECOMMENDED PROCEDURE:

1. Place traffic control devices as needed.
2. Remove damaged material, form, and reset anchors.
3. Pour concrete, cure, and remove forms.
4. Replace grate.
5. Remove traffic control devices.

RECOMMENDED MATERIAL:

- Anchor Bolts
- Concrete
- Form Material
- Water

SAFETY: Be careful when working near traffic. Wear all appropriate PPE. Refer to the [Safety Policies, Rules & Regulations – Employee Handbook](#).

OTHER CONSIDERATIONS: N/A

REFERENCES: Missouri Standard Specifications for Highway Construction Section; [614.10](#). Missouri Standard Plans [614.10](#), [713.10](#)

MAINTENANCE PLANNING GUIDELINES		2006																																																
ACTIVITY: Drainage (R316)	ACTION: Channel Control																																																	
MAJOR & MINOR																																																		
DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.																																																		
PURPOSE: To maintain and/or install channel control devices such as dikes, deflectors, riprap, gabion baskets, or other control measures.																																																		
SCHEDULING: As needed.	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> <tr> <td>A</td><td>E</td><td>A</td><td>P</td><td>A</td><td>U</td><td>U</td><td>U</td><td>E</td><td>C</td><td>O</td><td>E</td> </tr> <tr> <td>N</td><td>B</td><td>R</td><td>R</td><td>Y</td><td>N</td><td>L</td><td>G</td><td>P</td><td>T</td><td>V</td><td>C</td> </tr> <tr style="background-color: black;"> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>		J	F	M	A	M	J	J	A	S	O	N	D	A	E	A	P	A	U	U	U	E	C	O	E	N	B	R	R	Y	N	L	G	P	T	V	C												
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RECOMMENDED EQUIPMENT:	RECOMMENDED PROCEDURE:																																																	
<ul style="list-style-type: none"> • Dump Trucks • Backhoe • Excavator • Loader • Dragline • Traffic Control Equipment; (See EPG 616.23 Traffic Control for Field Operations) 	<ol style="list-style-type: none"> 1. Obtain Corps of Engineers permit, as required. 2. Call Dig Rite and check for MoDOT utilities. 3. Place traffic control devices as needed. 4. Remove debris from channel. 5. Install channel control devices. 6. Clean up work area. 7. Install erosion control devices as necessary 8. Seed and mulch as necessary. 9. Remove traffic control devices. 																																																	
RECOMMENDED MATERIAL:																																																		
<ul style="list-style-type: none"> • Riprap • Gabion Baskets, Ajax, & Rock • Fill Dirt • Seed • Mulch 																																																		
SAFETY: Wear all appropriate PPE. Refer to the Safety Policies, Rules & Regulations – Employee Handbook .																																																		
OTHER CONSIDERATIONS: Requires planning well in advance to obtain Corps of Engineers permit.																																																		
REFERENCES: Missouri Standard Specifications for Highway Construction Section; 802 , 803 , 803 805 , 806 . Missouri Standard Plans 806.10 .																																																		

R316 – Channel Control



(1) Indian Creek -- Howell County Roadway Embankment Scour Upstream End



(2) Indian Creek – Upstream Full Flow Condition



(3) Indian Creek – Upstream of Triple Box Culvert at Route AM



(4) Ajax Blocks



(5) Ajax Installation with Silt Blanket



(6) Ajax Installation - Continued



(7) Completed Installation of Ajax Blocks



(8) Ajax Blocks Performing Under Full Flow Conditions



(9) Erosion under structure



(10) Preliminary Grading for Gabions

MAINTENANCE PLANNING GUIDELINES		2006																																																
ACTIVITY: Drainage (R316)	ACTION: Slide Repair																																																	
MAJOR & MINOR																																																		
DEFINITION: The time and expenses incurred for the installation, repair and maintenance of roadway drainage ditches, structures, and all slide repairs. This includes installing and maintaining pavement drainage systems.																																																		
PURPOSE: To repair slides and to stabilize slopes.																																																		
SCHEDULING: As needed.	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> <tr> <td>A</td><td>E</td><td>A</td><td>P</td><td>A</td><td>U</td><td>U</td><td>U</td><td>E</td><td>C</td><td>O</td><td>E</td> </tr> <tr> <td>N</td><td>B</td><td>R</td><td>R</td><td>Y</td><td>N</td><td>L</td><td>G</td><td>P</td><td>T</td><td>V</td><td>C</td> </tr> <tr style="background-color: black;"> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>		J	F	M	A	M	J	J	A	S	O	N	D	A	E	A	P	A	U	U	U	E	C	O	E	N	B	R	R	Y	N	L	G	P	T	V	C												
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RECOMMENDED EQUIPMENT:	RECOMMENDED PROCEDURE:																																																	
<ul style="list-style-type: none"> • Dozer • Backhoe • Loader • Trucks • Excavator • Dragline • Traffic Control Equipment; (See EPG 616.23 Traffic Control for Field Operations) 	<ol style="list-style-type: none"> 1. Call Dig Rite and check for MoDOT utilities. 2. Place traffic control devices as needed. 3. Remove loose and unstable material. 4. Replace with recommended materials. 5. Clean work area. 6. Seed and mulch as necessary. 7. Remove traffic control devices. 																																																	
RECOMMENDED MATERIAL:																																																		
<ul style="list-style-type: none"> • Roadway Materials, as necessary as recommended by Construction/Materials Functional Unit • Slope Pins 																																																		
SAFETY: Use caution when operating equipment on steep slopes. Wear all appropriate PPE. Refer to the Safety Policies, Rules & Regulations – Employee Handbook .																																																		
OTHER CONSIDERATIONS: May need to obtain Corps of Engineers permit if a stream or channel is below slide area.																																																		
REFERENCES: REFERENCES: Missouri Standard Specifications for Highway Construction Sections; 802 , 803 , 805 , 806 . Missouri Standard Plans 806.10 .																																																		

