



MDT's mission is to serve the public by providing a transportation system and service that emphasize quality, safety, cost effectiveness, economic vitality and sensitivity to the environment.

CREDITS:

This manual was written and produced by the Maintenance Review Section, Jim Stevenson (Supervisor) and Clayton Linebarger.

The Maintenance Administrator, Chiefs, and Superintendents across the state of Montana have been very helpful in the development and fine-tuning of this manual.

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REFERENCES:

Asphalt Pavement Repair Manual of Practice, SHRP-H-348

SHRP Volume 3: Treatment of Cracks in Asphalt Concrete-Surfaced Pavements SHRP-3514

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INTRODUCTION

Pavement preventive maintenance is a tool that has the potential to both improve quality and reduce expenditures for our pavement system. Preventive maintenance is based on the concept that periodic inexpensive treatments are more economical than infrequent high cost treatments.

Several types of treatments can be used for preventive maintenance. However, regardless of the type of treatment, proper treatment, timing, materials, construction procedures and quality control will determine if the treatment is successful.

The objective of this manual is to provide MDT Maintenance personnel with:

- C Flow of activities from early planning through completion of the project.
- C Present materials, equipment, operation and traffic control consideration needed for a successful crack sealing.
- C Provide a glossary of terms, charts and forms used on a crack seal project.
- C Provide standardization of materials, equipment, techniques and traffic control for a crack seal project.

If a crack seal project is not properly designed and constructed, several potential problems can occur. A common problem occurs is the sealant coming out of the reservoir. This occurs if the routed reservoir is not clean, dry or in sound pavement.

Crack sealing, if properly designed and constructed, provides several benefits to the roadway surface: seals cracks, prevent water intrusion, prevents pavement deterioration, and extends the life of the pavement. It is critical that cracks are sealed on a regular basis to obtain the maximum life from the pavement.

ACTIVITY NUMBER DESCRIPTION

Activity Number

General Description

PRE-PLANNING OF THE PROJECT

100	Review pavement distress data
110	Review PMS optimization plan
120	Develop 3-year work plan
130	Review projected budgets
140	Meet with District and Division decision makers to determine if it's a federal project.
150	Select tentative projects
160	Estimate quantity of sealant to be purchased
170	Estimate projected cost for each project.
180	Establish priority list and time frames

PLANNING AND PROCUREMENT

190	Order crack seal material
200	Field submits crack seal contract ⁶
210	Crack seal contract worksheets
220	Division Maintenance Chief reviews bid document
230	Crack sealing contract is bid and awarded
240	Establish tentative dates for the project and notify personnel
250	Schedule equipment needs with the shop
260	Meeting with all supervisors involved in the project

PRE-PROJECT PREPARATIONS

270	Develop traffic control plan
280	Assign project duties and responsibilities
290	Make transportation and lodging accommodations
300	Check RWIS weather information
310	Contact informational services
320	Set up cost center number
330	Mow and sweep project
340	Gather and check portable signs and radios
350	Preconstruction meeting
360	Check with key personnel

<u>Activity Number</u>	<u>General Description</u>
370	Sweep project surface
380	Bring equipment to project
390	Load material for project
400	Load sealant into melter
410	Set up traffic control
420	Check mat and air temperature
430	Start routing
440	Start cleaning cracks
450	Check melter
460	Start sealing cracks
470	If the project is not complete, return to Activity 380 for next day
480	Fill out paperwork
490	Remove all traffic control signs from project
500	Fill out project completion paperwork

CHAPTER 1

CRACK SEAL ACTIVITIES

CHAPTER 1 – CRACK SEAL ACTIVITIES

PAVEMENT PREVENTIVE MAINTENANCE DEFINITION

A program strategy to:

- **Arrest Light Deterioration**
- **Retard Progressive Failures**
- **Reduce The Need For Corrective Maintenance**

There are several different definitions of pavement preventive maintenance. This definition recognizes preventive maintenance as a program strategy that can arrest light pavement deterioration, retard progressive failure and/or reduce the need for corrective maintenance.

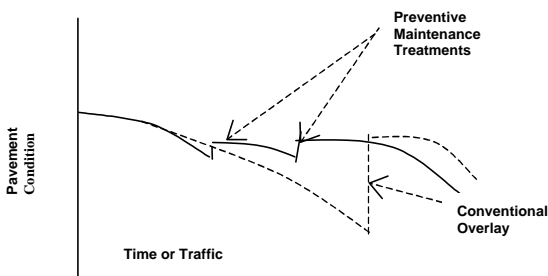
Preventive maintenance is applying the right treatment to the right pavement at the right time.

OBJECTIVE

Keep the pavement condition above a level that would require corrective or routine maintenance strategies.

The objective of a preventive maintenance program is to extend the functional life of the pavement by applying treatments before the pavement deteriorates to a condition that requires a corrective treatment such as structural overlay.

PROGRAM STRATEGY



A pavement preventive maintenance program consists of a series of treatments applied to the pavement over time. These can be a combination of different treatments, such as periodic crack seal treatments followed by a chip seal. The objective of this program is to provide better quality service to the highway user, both in terms of pavement quality and cost effectiveness.

Note: Preventative maintenance crack seals are eligible for federal-aid funding.

**WHEN SHOULD A PAVEMENT
PREVENTIVE MAINTENANCE
TREATMENT BE APPLIED**

One of the most important questions asked is when should we apply a preventive maintenance treatment? The need for preventative maintenance of a vehicle is well understood. Equipment preventative maintenance schedules are based on usage and not the condition of the equipment: **“THE PAY ME NOW OR PAY ME LATER CONCEPT.”** The same concept applies to pavement systems.

**TYPICAL PREVENTIVE
MAINTENANCE TREATMENTS**

- *Thin Overlay*
- *Chip Seal*
- *Crack Seal*

Thin overlays, chip seal and/or crack sealing can be preventive maintenance treatments. However, PROPER TIMING of the application is the key to whether the treatment is preventative or not.

OBJECTIVES OF CRACK SEALING

- *Seal Cracks*
- *Prevents Deterioration of Pavement*
- *Prevents Intrusion of Water*
- *Extends the Pavement Life*

There are two common strategies to crack maintenance: crack sealing, and crack filling. Crack filling only fills the crack with material with the idea of retarding water into the pavement.

Crack sealing prevents the intrusion of water into the pavement. This manual will look at crack sealing only. Crack sealing can extend the life of pavement by preventing water from getting into the pavement. Crack seal should be done every 2-3 years after the placement of a new asphalt surface or when significant reflective cracking is evident.

Activity 100

REVIEW PAVEMENT DISTRESS DATA

- **Surface Distress**
- **Roughness**
- **Skid Resistance**
- **Non-Destructive Testing**

Selection of a crack sealing project depends on the condition of the pavement and the objective of the crack sealing. The following Pavement Management System information should be considered when evaluating the condition of the pavement: Surface distress (i.e., transverse, longitudinal cracks, and block cracking combined make up the miscellaneous cracking, alligator cracking, roughness (IRI), skid resistance and non-destructive testing. Pavement distress information is essential to help you determine if a crack seal is an appropriate preventive maintenance strategy.

WHEN TO USE CRACK SEALING

Distress:

- **Minor Alligator Cracking**
- **Transverse Cracking**
- **Longitudinal Cracking**
- **Block Cracking (minor)**

EVERY 2-3 years on new pavement surfaces

Structural distress (alligator cracking) cannot be corrected with a crack seal. Depending on the degree, severity, and frequency of the alligator cracking, crack sealing will only temporarily seal the cracks. Other maintenance strategies, including crack filling (non-routing) or surface sealing, may be more cost effective.

All new overlays and pavements should be crack sealed every 2-3 years.

Activity 110

REVIEW PMS OPTIMIZATION PLAN

- ***Review Potential Project List***
- ***Prioritize Projects***
- ***Review Pavement Preservation Budget***
- ***Optimize Project List***

The Pavement Management System's distress information and optimization routine will provide a list of potential projects. Based on the projected pavement preservation budget, project priorities can be established based on their benefit to the entire highway system.

Activity 120

DEVELOP THREE-YEAR WORK PLAN

- ***Establish Project List***
- ***Establish Project Priorities***
- ***Establish Maintenance Treatments***

A one-, two- and three-year tentative work plan should be established based on the Pavement Management System's distress data. Once the projects are established, the type of maintenance treatment and its objective can be assigned. This process will help you to identify your long-term commitment to preventive maintenance strategies.

Activity 130

REVIEW PROJECTED BUDGET

- ***Compare Projected Budget to Work Plan***
- ***Revise Project Priorities as Necessary***

After establishing tentative one to three-year work plans, project priorities, and maintenance treatment, a comparison to the projected budget should be made. Budget limitations or spring breakup may cause project priorities to be changed.

Activity 140

MEET WITH DISTRICT AND DIVISION DECISION MAKERS

- ***Review Proposed Construction Projects for Next Three Years***
- ***Review Proposed Maintenance Projects***
- ***Come to Consensus on One to Three-Year Maintenance Plan***

A variety of topics can be handled at this meeting. The Construction Engineer can lay out the proposed construction program that could possibly eliminate a maintenance project, or vice versa. Maintenance could also look at doing a 'preventive' maintenance project on a recently completed construction project, such as crack sealing. Are there any poor roads not in the construction program that need thin lift overlays or 'reactive' maintenance? Come to a consensus on a tentative one to three-year work plan with the District Administrator and other decision-makers.

Activity 150

SELECT TENTATIVE PROJECTS BASED ON ACTIVITY 140

Select tentative projects and type of treatments based on best available data, observations and meetings. There is a good chance project priorities may change. Consequently, you should develop costs and plans for alternative projects.

Activity 160

ESTIMATE QUANTITY OF SEALANT TO BE PURCHASED

- ***Determine the Amount of Cracks to be Sealed.***
- ***Determine Materials on Hand***
- ***Determine Materials to be Purchased***
- ***Can you afford it?***

Before you can determine the amount of crack sealant needed, you need to determine the amount of cracks to be sealed. A good method for estimating the quantity of cracking is: count the exact amount of cracks within a one-mile segment at three or four random locations on the project. Take an average from those locations and multiply by the length of the project. For estimating purposes, one pound of sealant will generally go 2.0 - 2.5 feet.

You may have a small quantity of sealant on hand, but not enough for your projects. You will need to compute the additional pounds of sealant needed. NOTE: You will need to submit samples of each different lot of material.

Do these quantities and costs fit into your projected budget?

Activity 170

ESTIMATE PROJECTED COST FOR EACH PROJECT, TOTAL AND COMPARE TO PROJECTED BUDGET

- **Contracted services?**
- **Material costs?**
- **Personnel cost?**
- **Equipment cost?**
- **Per Diem cost?**

You will need to compute all costs for the projects. Total your projects and compare to your projected budget. Be sure to include all of your expenses and compare those costs to a crack seal contract. At this point you will need to determine who is going to do the project, i.e., state forces or contractor.

Activity 180

ESTABLISH PROJECT PRIORITY LIST AND TIME FRAMES

- **Project Priority**
- **Project Length**
- **One Year From Start of Project**

After you have assigned costs to projects, your priorities and project lengths may have changed. You should re-address your priorities and make adjustments with the same group suggested in Activity 140.

Activity 190 (Allow 6 mo. to start of project)

ORDER CRACK SEAL MATERIAL

- **Calculate Total Sealant Quantities (for all projects)**
- **Estimate Cost**
- **Compare to Budget**
- **Locations**

Twice a year the Maintenance Division goes out for a crack sealant bid. You will need to purchase sealant if you plan on maintenance forces doing the crack sealing.

You will not need to purchase sealant if you are going to use a contract for crack sealing.

Activity 200 (Allow 3 mo. to start of project)

FIELD SUBMITS CRACK SEAL CONTRACT

- **Specifications of Work**
- **Completion Date**
- **Quantities**
- **Estimated Costs**

Each maintenance area needs to fill out the Crack Seal Contract. They must fill in the “Specification of Work,” quantities, and completion dates. Send the completed form to the Maintenance Division for review.

Activity 210 (Allow 3 mo. to start of project)

CRACK SEAL CONTRACT WORKSHEETS

- **Review**
- **Approve**
- **Submit to Purchasing**

The Maintenance Division will review the completed crack seal contract worksheets to make sure it is intact and accurate. Upon completion of the review by the Maintenance Division they send the worksheets to the Purchasing Bureau for letting.

Activity 220 (Allow 3 mo. to start of project)

DIVISION MAINTENANCE CHIEF REVIEWS BID DOCUMENT

- **Wording**
- **Quantities**
- **Locations**
- **Dates**
- **Details**

The Maintenance Chief should read over the bid document from the Purchasing Bureau. Make sure the contract says what you want it to say. Review the specifications for work, terminology, dates, quantities, site locations and all details that will make a good, workable contract.

Activity 230 (Allow 3 mo. to start of project)

**CRACK SEALING
CONTRACT IS BID AND AWARDED**

Early planning and paying attention to details will ensure your request goes to bid letting on time to meet your needs

Activity 240 (Allow 1 mo. to start of project)

**ESTABLISH TENTATIVE DATES FOR
THE PROJECT AND NOTIFY
PERSONNEL**

- ***Dates from Start to End of Project***
- ***Notify Affected Personnel***
- ***Get Contractor's Tentative Start Date***

Now is the time to set a tentative start date for the project. If the project is to be done by a contractor, get their tentative start date. Communication is important for all participants. Let your employees know when the job is scheduled, where it's going to be, who will likely be needed and why this project was selected.

Activity 250 (Allow 1 mo. to start of project)

**SCHEDULE EQUIPMENT NEEDS
WITH THE SHOP**

- ***List Modifications***
- ***PM 1 or 2***
- ***Talk With Your Shop Foreman About How Much Lead Time They Will Need***

If MDT is doing the job, equipment shops need as much time as possible to prepare equipment for a project. A good idea is to have any repairs done, or scheduled to be done at the end of the previous season. For instance, if at the end of the season you know you would like work done to the melter or air compressor, schedule to have it done when you have finished with it. Early notice also allows the shop flexibility in scheduling work. Also, assess whether there is any new equipment that may require training or manuals? Many minor unforeseen problems arise that can be repaired on the spot without holding up the project. One spare tire for each type of vehicle should be on the job as well. Know where to find a backup melter and air compressor or available replacement parts.

Activity 260 (Allow 1 mo. to start of project)

MEETING WITH ALL SUPERVISORS INVOLVED IN THE PROJECT

- **Equipment Needed**
- **Personnel Needed**
- **Assigned and Delegated Tasks**

The Maintenance Chief, Superintendent and Field Supervisors need to meet to determine equipment and personnel needed for the project. When making assignments, be sure to consider equipment needed, what equipment is available, what condition the equipment is in, who will operate that equipment, if equipment operators are available, union contract requirements, location of personnel, lodging required for personnel, and MMS Management.

To ensure a smooth operation, delegate responsibility for major task areas to key personnel.

Activity 270 (Allow 1 mo. to start of project)

DEVELOP TRAFFIC CONTROL PLAN

- **Montana Supplement**
- **MUTCD**
- **District Traffic Engineer**
- **Piloting**
- **ADT**
- **Intersections**
- **Length of Project**

Safety on the job, smooth flow of traffic and liability are all-important to the success of the project. Management should include the District traffic control plan for the project. Reference the Maintenance Work Zone Guidelines. Identify who will be responsible for the work zone and communicate your plans both verbally and in writing. Document your plans and include inspections of the work zone in the Superintendent or Field Supervisor's diary.

NOTE: If the project is being done by a contractor they must provide you a traffic control plan.

Activity 280 (Allow 2 wks. to start of project)

ASSIGN PROJECT DUTIES AND RESPONSIBILITIES

- **Planning**
- **Scheduling**
- **Training**
- **Transportation**

Personnel need to know as soon as possible what their roles and responsibilities for the project will be. There may be new employees who will have questions about the process, or there may be training that needs to be addressed, such as what is expected of people using the router, sealant pot, wand, or who is going to be the inspector if the project has been let to contract.

Activity 290 (Allow 2 wks. to start of project)

**MAKE TRANSPORTATION AND
LODGING ACCOMMODATIONS**

- ***Determine Who Needs Lodging***
- ***Determine How to Get Personnel to Project***

Some projects will require you to bring personnel from different sections to work the project. In those cases, you need to look at the cost of overtime versus providing personnel with per diem. Another issue is getting personnel to and from the project site.

Activity 300 (Allow 2 wks. to start of project)

**CHECK RWIS WEATHER
INFORMATION**

- ***Check 2 Weeks Prior to Project***
- ***Check 1 Week Prior to Project***
- ***Check Day Before***

You should check Remote Weather Information Systems (RWIS), or other weather information, beginning about two weeks prior to the start of the project for surface temperature. You should start checking the weather information more frequently the closer you get to the start of the project. This is critical if the weather is somewhat unsettled. Crack sealing in poor weather conditions could result in a failed crack project. See Chapter 4 on the critical RWIS information for crack seals and how weather can effect the success of your project. MDT specifications recommend crack sealing can only be done with surface temperatures between 35°F (2°C) and 120°F (49°C).

Activity 310 (Allow 2 wks. to start of project)

CONTACT INFORMATIONAL SERVICES
<hr/>
<ul style="list-style-type: none">• <i>Type of Project</i>• <i>Location of Project</i>• <i>Date of Project</i>• <i>Special Considerations</i>

The Division Construction Program should be notified the week prior to the start of the project. They will notify the radio stations and newspapers in the area of the project, the locations, and the dates. This information will be passed on to Public Affairs for statewide distribution. You should note to them that this project is weather-dependant.

Activity 320 (Allow 2 wks. to start of project)

SET UP COST CENTER NUMBER
<hr/>
<ul style="list-style-type: none">• <i>Beginning and Ending Milepost</i>• <i>Date</i>• <i>Activity Number (1106)</i>

Prior to the start of the project, the MMS cost center number for the project needs to be established. The key information needed is the beginning and ending mileposts, date, and the activity number for the crack seal.

NOTE: For tracking purposes, the MMS cost center number will be required for the project.

Activity 330 (Allow 2 wks. to start of project)

SWEEP PROJECT
<hr/>
<ul style="list-style-type: none">• <i>Sweep Availability</i>• <i>Quality</i>

Sweep all dirt from the surface. You may need to return prior to the start of the project for additional sweeping.

Activity 340 (Allow 1 wk. to start of project)

**GATHER AND CHECK PORTABLE
SIGNS AND RADIOS**

- **Check Traffic Control Plan**
- **Determine Signs Needed**
- **Gather and Check Signs**
- **Place All Signs in One Location**
- **Locate and Charge Hand-Held Radios**

Gathering and checking the portable signs prior to the start of the project may eliminate any mix-ups. Check the traffic control plan for the appropriate signs. All signs should be in good condition. The use of hand-held radios can also be beneficial for traffic control purposes. If you plan on using radios, ensure that they are in working order prior to the start of the project. Use Channel 2 (truck-to-truck) whenever possible for flagger communication. See Chapter 5 for appropriate signs and quantities.

Activity 350 (Allow 1 wk. to start of project)

PRECONSTRUCTION MEETING

- **Establish Firm Start Date**
- **Reaffirm Major Duties and Responsibilities**
- **Reaffirm Construction Procedures**
- **Discuss Traffic Control Plan**

If contracted, it is required that a preconstruction meeting be held prior to the start of the project. All key personnel who have major project responsibilities (Activity 280), should attend the meeting. Construction procedures and expectations should be established so everyone understands who is responsible, what is expected, when the project will be done. This is the time to answer any 'why' questions.

If the Project has been let to contract, the same information should be relayed to the contractor. **Be sure the contractor provides you with a written work plan and traffic control plan.**

Activity 360 (Allow 1-2 days to start of project)

CHECK WITH KEY PERSONNEL

- **MMS and Sampling**
- **Equipment**
- **Traffic Control**
- **Media**

Make a last-minute check to make sure everything is ready. Solve any problems that may have become evident. Make sure the media is aware of the project dates, locations and potential traffic re-routing to avoid the project. In Activity 310 you reported the crack seal project to the construction program to be communicated to the public. This step should reduce the amount of traffic in the project area ensuring improved safety, improved quality of the crack seal and reduce inconvenience and potential for tort liability claims.

Activity 370 (Allow 1-4 days to start of project)

SWEEP PROJECT SURFACE

- **Adhesion**
- **Availability**

A clean surface is necessary for the sealant to adhere to the pavement. Dirt, grass, loose material or tracked mud from approaches need to be removed. Unexpected conditions or situations have been known to occur the night before the project starts, requiring the use of a broom.

If the project has been let to contract, ensure the contractor removes any dirt or loose material.

Activity 380 (Allow 1 Day)

BRING EQUIPMENT TO PROJECT

- **Air Compressor**
- **Melter**
- **Router**
- **Additional Cutters**
- **Squeegee (Optional)**
- **Hot Air Lance (Optional)**
- **Dish**

The day of the project you will need to ensure that all of the equipment gets to the project site. Remember to fuel up all of the equipment prior to heading out to the project. Bring at least one complete set of carbide cutters for each router. Although a hot air lance is not recommended, if you are using one, extreme caution must be used so as not to burn the existing pavement.

Activity 390 (Allow 1 Day)

LOAD MATERIAL FOR PROJECT

- **Sealant (Crafco 522 or Equivalent)**
- **Backer Rod (if needed)**
- **Make Sure Melting Pot is Fueled (Propane and/or Diesel)**

You should have a supply of sufficient sealant and backer rod to last for the entire day.

Activity 400 (Day of Project)

LOAD SEALANT INTO MELTER

- **Heat Only to Maximum Specifications Provided by Manufacturer**
- **Make Sure All Gauges are Working Correctly**
- **Check for Plugged Hoses**

After you have started the melter, make sure all gauges are working correctly. If not, shut the machine off and replace before continuing. Run sealant back into melter to see if any hoses are plugged. If plugged, leave in on position and place back into melter until it unplugs. **Do not use propane torch on hoses to try and unplug them.**

Activity 410 (Day of Project)

SET UP TRAFFIC CONTROL

- **Check Traffic Control Plan**
- **Check Work Zone Safety Guide**
- **Set Up Traffic Control Signs**
- **Uncover Post-Mounted Signs**
- **Start Flagging Operations**

Check the traffic control plan (Activity 270) and the Department's work zone guide if there are any questions about signs, spacing, or flagger operations. Traffic control and flagger operations on two lane roadways must be in place prior to having any equipment on the roadway or any crack seal operations in progress. Any permanent signs that conflict with temporary signs must be covered.

Activity 420 (Day of Project)

CHECK MAT AND AIR TEMPERATURE

- **Check Mat Temperature**
- **Check Air Temperature**
- **MDT Specifications**
- **SEE CHAPTER 4**

The mat temperature must be 2° C (35°F) and rising prior to the start of the crack sealing.

MT specifications indicate crack seals can only be done between 2° C (35° F) and 49° C (120° F). See Chapter 4 on temperature considerations during crack seal operations.

Activity 430 (Day of Project)

START ROUTING

- **Check Router Cutter Setup**
- **Depth**
- **Width**
- **Use Carbide Cutters**

Before beginning to rout, make sure cutter posts, washers and cutters are in good working condition and are set to make a 1½ in. x ? in. (40 mm x 10 mm) rout. Rotation of cutters will help cutters last longer by reducing rounding of the cutters.

The use of carbide cutters is highly recommended.

Activity 440 (Day of Project)

START CLEANING CRACKS

- **Use Air Compressor**
- **Minimum 125 CFM**
- **Clean**
- **Dry**

Ensure the reservoir and crack are dry and free of dust, dirt and loose materials immediately before placing the backer rod, if applicable, and before applying the sealant. Use air equipment producing at least 125 CFM. Drain water from the compressor daily.

Activity 450 (Day of Project)

CHECK MELTER

- **Temperatures of Heat Transfer Oil**
- **Temperatures of Sealant**
- **Turn Off Agitator When Loading Sealant**

Crack sealant must be melted in a jacketed double boiler-type melting unit which is equipped with both agitator and recirculating system.

The temperature of the heat transfer oil in the melting unit should not exceed 274°C (525°F) when melting crack sealant. The melter should be capable of melting sealant to 204°C (400°F).

Do not overfill transfer oil. Check the manual for instructions.

Do not agitate when adding new blocks of sealant because splashing may occur.

Recommended technique is the 4 to 1 (1½ in. x ? in.) and flush fill. Use of a squeegee is not recommended except to correct filling mistakes.

Blotting is recommended if traffic is put on fresh sealant before it has time to cool and set up. A good blotter is single-layer toilet paper applied immediately after sealant is applied using a long handled paint roller.

At the end of the day's work, remove all relative traffic control signs.

Return to Activity 380 every day following the first day until you complete the project.

Make sure you keep up on the daily MMS paperwork. It is important to fill out a daily field diary for the project. Note any changes or problems, such as traffic control changes.

See Chapter 6 for examples of paperwork and forms to be filled out.

Activity 460 (Day of Project)

START SEALING CRACKS

- **Flush Fill**
- **Use of a Squeegee (Optional)**
- **Apply Blotter, if necessary**

Activity 470 (Day of Project)

**IF THE PROJECT IS NOT COMPLETE,
RETURN TO ACTIVITY-380 FOR
NEXT DAY**

Activity 480 (Day of Project)

FILL OUT PAPERWORK

- **MMS Paperwork**
- **Field Diary**

Activity 490 (Day of Project)

**REMOVE ALL TRAFFIC CONTROL
SIGNS FROM PROJECT**

- **Post-Mounted Signs**
- **Temporary Speed Limit Signs**
- **Uncover Permanent Speed Limit Signs**

When the project is completed, remove all post-mounted and temporary signs from the area. Uncover all the permanent signs that had to be covered while the project was underway.

Activity 500 (Day of Project)

**FILL OUT PROJECT COMPLETION
PAPERWORK**

- **MMS**
- **PMS**
- **Field Diary**

Upon completion of the project, there will be paperwork to fill out. MMS paperwork needs to be filled out. Complete the pavement management system form for the project and send it in to the Maintenance Division. You will need to fill out the paperwork so that the contractor gets paid.

CHAPTER 2

TREATMENT OBJECTIVES

CHAPTER 2 - TREATMENT OBJECTIVES

Crack sealing refers to the application of sealant material to pavement cracks to significantly reduce crack deterioration and the intrusion of water. Although once considered to be a routine maintenance operation, today it is largely a preventive maintenance strategy, performed early in a pavement's life so as to more effectively extend its life.

Crack sealing and crack filling are the two types of crack treatment. Although little distinction has been made in the past between these activities, the purposes and functions of each must be clearly understood so that the most cost-effective and long-lasting treatment is applied.

- ? **Crack sealing** is the placement of specific material into working (transverse) or non-working (longitudinal) cracks using specific configurations to prevent the intrusion of water and incompressibles into the crack.
- ? **Crack filling** is the placement of material into cracks to temporarily reduce infiltration of water.

Cracks can be classified as either working or non-working. For example, transverse or diagonal cracks are usually found to be working cracks because of the sizable spacing between adjacent cracks (often greater than 88m). Longitudinal and block cracks, on the other hand, are normally found to be non-working cracks due to the short crack spacing or close proximity to the free edge of the pavement. Working cracks change crack width more dramatically with temperature changes in the mat. This requires the crack sealant be more elastic than sealants for non-working.

MDT GUIDELINES

Evaluation of Cracks

1. All overlays, asphalt resurfacing and new pavement surfaces shall be crack sealed, using these guidelines, at least every third year or when reflective cracks are evident, following completion of the project.
2. District personnel should assess the crack sealing needs in their areas using the Pavement Management System and visual analysis.
3. The following guidance is provided for the selection of crack seal candidates:
 - ? Selection of crack seal candidates should be made by referring to the annual Interstate, Primary Treatment and Secondary System Report published by the Pavement Management Section. Crack seal candidates in this report are selected by quantifying non-load related cracking (transverse, longitudinal and block cracking) into a Miscellaneous Cracking Index.

- ? A Miscellaneous Cracking Index score between 70 and 95 represents a good potential candidate for crack sealing, provided there is no significant load-related distress (alligator cracking or rutting) present.
- ? All crack seal candidates should be carefully field reviewed before the final selection is made.
- ? If the pavement exhibits block or alligator base cracking, the procedure described in this manual should not be utilized. A crack filler such as CRF-Pm (cold pour), or other maintenance treatments are recommended where extensive cracking is present.
- ? Cracks filled with CRF-Pm may not be a good candidate for hot pour crack sealant.

CHAPTER 3

MATERIALS CONSIDERATIONS

CHAPTER 3 – MATERIALS CONSIDERATIONS

Sealant Considerations

There are many different crack-treatment material products on the market today, each with distinct characteristics. The products essentially comprise three material families and are often grouped by material type, according to their composition and manufactured process. The principal materials are:

? **Cold-applied materials:**

- Liquid asphalt (emulsion, cutback)
- Polymer-modified liquid asphalt emulsion

? **Hot-applied materials:**

- Asphalt cement
- Mineral-filled asphalt cement
- Fiberized asphalt
- Asphalt rubber
- Rubberized asphalt
- Low-modulus rubberized asphalt

? **Chemically-cured thermosetting materials:**

- Self-leveling silicone – recommended for concrete joints only

Asphalt cement and liquid asphalt have little flexibility and are very temperature susceptible. Thus, they are limited to use as crack filler, not as a crack sealer. Additives such as mineral fillers and fibers provide minimal elasticity to asphalt and do not significantly affect temperature susceptibility. Mineral-filled and fiberized asphalt are most appropriate in crack filling operation.

The addition of rubber polymer to liquid or heated asphalt generally improves field performance because it give flexibility to the asphalt. The degree of flexibility basically depends on the type and nature of the asphalt, the percentage of vulcanized rubber used, and how rubber is incorporated into the asphalt (i.e., mixed or melted in). Other polymers are often incorporated into asphalt either exclusively or along with rubber to increase resilience.

MDT Guidelines specify the following materials specification for all preventive maintenance projects.

The product provided, as a result of award of contract bid, shall meet or exceed the following capability and testing specification requirements, 1 through 10.

1. Cone penetration, 77°F, dmm (ASTM D5329) 100-150
2. Cone penetration, 0°F, dmm (ASTM D5329 MOD) 25 min.
3. Flow, 140°F, 5h (ASTM D5329) 10 mm max.

- | | | |
|-----|--|---------------|
| 4. | Resilience (ASTM D5329) | 30-60% |
| 5. | Bond, -20°F, 200% ext. (ASTM D5329) | Pass 3 Cycles |
| 6. | Recommended pour temperature | 380°F |
| 7. | Safe heating temperature | 410°F |
| 8. | Asphalt compatibility (ASTM D5329) | Pass |
| 9. | Product shall be free of fabric, metal, water, volatile solvents or any other contaminating debris. | |
| 10. | Product shall, during the production process, be heated to a sufficient temperature to guarantee activation of all product components. | |

Testing of product shall be conducted based on the assumption that activation has taken place, thus making activation during field use and testing unnecessary.

Any other product, be it cold- or hot-applied material, is acceptable on projects that are **non-preventive maintenance projects**.

Materials Temperature Considerations

The specific recommendations provided by the manufacturer of the material to be placed should be followed closely. These recommendations generally include minimum placement temperature, material heating temperatures, re-heating unused product, prolonged heating, and allowable pavement temperature and moisture conditions.

- **Recommended application temperature** is the temperature of the material at the nozzle that is recommended for optimum performance.
- **Safe heating temperature** is the maximum temperature that a material can be heated to before experiencing a breakdown in its formulation.

Recommended application temperatures for hot-applied materials generally range from 380°F (193°C) to 410°F (210°C).

Before heating a material, kettle operators should know its safe heating temperatures and the effects of overheating or extended heating. The effects of overheating or extended heating depend on the specific material. Some materials exhibit a thickened, gel-like consistency, while others thin out or soften considerably. In either case, discard the material and prepare new material.

Other preparation-related concerns for hot-applied materials include prolonged heating and re-heating that result from work delays. Most hot-applied materials have prolonged heating periods between 6 and 12 hours, and they may be reheated once. In both instances, add more material, if available, to extend application life.

Three guidelines for initial heating of hot-applied materials are:

1. Begin heating so that the material is ready the time normal work operations begin.
2. Regulate oil temperature so the temperature of the material, does not exceed the material manufacturer's safe heating temperature recommendations.

3. Maintain material temperatures within the recommended application temperature range.

Material Application Consideration

Begin the hot-pour application once the material has reached the recommended application temperature and the first few cracks have been prepared. From this point, the focus is on three items:

1. Ensure material remains at or near the recommended application temperature without overheating.
2. Maintain a sufficient supply of heated material in the kettle.
3. Properly dispense the right amount of material into the crack reservoir.

The melter operator must be fully aware of the recommended application temperature and the safe heating temperature of the material being installed. These temperatures are generally marked on the material containers for quick and easy reference.

Maintaining a consistent material temperature can be difficult, especially in windy conditions and cold weather. Underheated material may produce a poor bond and/or freeze up the application line, which causes a work delay. **However, overheating will also lead to either poor treatment performance and operator safety concerns.**

Guidelines for maintaining hot-applied material in a sufficient quantity and at the proper temperature during application are:

1. Check the temperature of the material at the nozzle and in the melting vat. It is recommended that the temperatures be checked using a hand-held infrared temperature gun.
2. Adjust the heating controls to reach the recommended application temperature (or as near to as possible without exceeding the safe heating temperature.)
3. Check the sealant temperatures regularly and adjust as necessary.
4. Watch for carbon buildup on the sidewalls of the heating chamber and visually inspect material for changes in consistency.
5. Check the level of material in the melting vat periodically. Add material on a regular basis to avoid heat loss from a large quantity of cold material.

General guidelines for material application include:

1. Apply the material with the nozzle in the crack channel so that the channel is filled from the bottom up and air is not trapped beneath the material.

2. Apply the material in a continuous motion, making sure to fill the channel to the proper level (flush with the pavement surface).
3. Reapply material to crack segments where material has sunk into the crack or an insufficient amount was furnished in the previous pass.
4. Re-circulate material through the wand into the melting vat during idle periods.

Backer Rod Installation

If a particular project calls for the use of backer rod with the treatment material, the backer material may be installed after the cleaning activity using one of a variety of insertion devices. The selected device should allow for quick and accurate placement of the rod into the reservoir without severely twisting, puncturing, or otherwise damaging it in the process.

Material Blotting

The objective of blotting is to provide sufficient cover or protection of the uncured treatment material so that it does not track under traffic. The equipment necessary for this activity depends on the type of blotter material to be used.

Toilet paper, cement and Genzoil are often used when rubber-modified asphalt materials must be blotted to prevent tracking. Apply these blotters immediately after finishing so that they stick to the material and serve as temporary covers.

Toilet paper rolls can usually be loaded on the same truck with the prepackaged sealant blocks. For easy application, individual rolls can be placed on a modified paint roller (equipped with a long handle). As for cement and dusts, take care not to overapply them to the treatment material.

CHAPTER 4

EQUIPMENT CONSIDERATIONS

CHAPTER 4 - EQUIPMENT CONSIDERATIONS

Router Considerations

The objective of routing is to create a uniform, rectangular reservoir, centered as closely as possible to the surrounding pavement. Routing can inflict additional damage on the pavement and is often the slowest activity in sealing operations, it is desirable to use a high-production machine that follows cracks well and produces minimal spalls or fractures.

Regardless of the type of cutting equipment used, make every effort to follow the crack accurately while cutting. Even though production may be considerably compromised on jagged cracks. Centering the cut over the crack as much as possible provides added leeway when cutting.

Poor routing will increase the amount of secondary cracking that occurs over time. One of the benefits of a 4 (width) to 1 (depth) rout, is less secondary cracking.

Cutters

The type of router bit you choose can affect both the physical damage done to the pavement surface and overall productivity. For these reasons, carbide router bits are highly recommended over steel bits. In addition, the carbide, while more expensive, will generally last five times longer, which will increase productivity.

Router carbide bits should be rotated or changed on a regular basis (once or twice per day) or when needed. **As bits wear you will notice rounded vertical walls, uneven or non-uniform reservoirs, and/or router will begin to jump.**

Use the two cutter offset on every other post for the 4 to 1 (1½" x ? "). A total of 12 cutters are required for this configuration. Another setup is to use 3 cutters with a spacer on 1 post with 2 cutters and a spacer in between on the next post. Use this every other post for a total of 15 cutters. See Figure 1 on page 31 for illustration.

Remember to set the depth guide prior to routing. If you have a recent chip seal, you will need to route approximately ½" instead of the ? ".

Operation

Routing cracks is the most labor-intensive and time-consuming operation in the crack sealing operation. Crack spacing, reservoir dimension, pavement temperature, and type of aggregate all affect production rate. Since routing is so time-consuming, both router maintenance and safety are often overlooked. The following are some router maintenance and safety tips:

- Prior to use, schedule router with shop for PM 1 to see that it is in excellent working order.
- Router must be thoroughly cleaned with air hose, and all dust and dirt removed.
- Filters need to be checked and/or replaced if needed daily.

- Oil needs to be changed frequently and machine greased at least twice a day.
- Check hydraulic oil daily.
- Check tires and inflate or deflate as needed daily.
- Don't back out of the lane closure and into traffic.
- Periodically use air hose and blow and clean router.
- Ear and eye protection.
- When beginning to rout, make sure handle is set at chest level and in a comfortable position.
- Steel-toed boots.
- Foot position is important when pulling the router, keep your front foot directly under handle while pulling backwards.
- When cutting is finished, do not tip router forward to exit from cut. Don't exit the crack by lifting up lever on the handle. For safety reasons, ensure the route bits don't come in contact with the pavement when exiting.

Kettle or Melter Considerations

Rubberized asphalt materials must be heated and mixed with indirect heat, agitator type kettles/melters. Melters burn propane or diesel fuel and heat is applied to transfer oil, which surrounds the melting vat containing the sealant. These types of kettles/melters provide a safer, more controlled method to heat the sealant. Agitation of the sealant provides a uniformity-heated material.

Depending on the type, amount of material and size of the kettle, the material may take 1-2 hours to reach its proper application temperature.

It is critical that the operator keeps the material within its correct application temperatures. Check your thermostats for materials and heating oil temperature on a regular basis.

Operation

- Prior to use, schedule melter with shop for PM 1 to see that it is excellent working order.
- Check all gauges and replace if not in working order.
- Check transfer oil and fill to full level (cold).
- Check tires and inflate or deflate as needed.
- Clean all hoses and replace if not capable of withstanding 425-degree temperatures.

- Make sure wand and turn on/off valve is in good working order.
- After removing wand from melter keep pointed downward for safety reasons.
- Put wand back in melter and turn on to circulate sealant and prevent plugging.
- Fire extinguisher.
- What do you do if you get hot sealant on you? (First aid burn kit)
- Trailer hookups.
- Lights or slow-moving symbol.

Kettle Cleanup Considerations

At the end of each day's work, suck hot-pour material back into kettle from the applicator system lines on the asphalt kettle. Closely monitor the amount of material in the melting vat so that as little material as possible remains when work is finished for the day.

If flushing solvents are used in cleanout, the kettle operator must ensure that they do not contaminate the sealant or filler material. Step-by-step instructions on how to clean kettles and applicator lines are generally found in the kettle manufacturer's operation manual. Remember to properly dispose of the contaminated material.

Air Compressor Considerations

Air blasting is the most common approach to clean both routed and non-routed cracks. There are two different types of equipment that is used to air blast cracks:

- Portable backpacks or power driven blowers
- High-pressure air compressors with hoses and wands

Backpack and power-driven blowers can be used to blow loose fragments from the cracks and pavement surface. However, they cannot be used alone to clean the cracks. **High-pressure air compressors are required for crack cleaning.**

High-pressure air blasting provides no heat and very little drying of moisture in the cracks. Therefore, it is critical that the pavement and the crack reservoir be completely dry. Furthermore, some air compressors may introduce water and oil into the air supply. Therefore, compressors should be equipped with moisture and oil filters to remove these contaminants from the air supply. Drain moisture from air compressor or tank daily.

Operation

The crack reservoir must be air blasted or cleaned and dried immediately before sealant installation. If rain or dew has contaminated the crack reservoir, they must be air blasted and dried prior to sealing. Air blasting requires the following.

1. Use approved air compressors, safety equipment (eye and ear) and safety procedures.
2. Hold the nozzle no more than 50 mm (2 inches) from the pavement surface.
3. Blow debris in front of the nozzle. Do not walk backwards.
4. Don't blow debris towards vehicles.
5. Make slow or repeated passes until the joint reservoir is completely clean.
6. Elevate and fan the nozzle across the pavement on the last pass to remove debris from the joint area to a area where it cannot re-contaminate the joints.

7. Ensure a safety wire or clip is in place to prevent hoses from separating from compressor.

The most common problems encountered in air blasting are related to contamination of the air stream or lack of air volume and pressure.

Problems Encountered	Possible Solutions
Oil in airstream.	Ensure oil/moisture filter is functional. Clean or replace the hose.
Moisture in airstream.	Ensure oil/moisture filter is functional. Drain holding tank.
Air not removing dust, dirt, and sand.	Use a larger compressor. Use a larger diameter hose. Reduce the nozzle-opening diameter.

Remember the most important aspect of the crack seal operation is cleaning and drying the routed reservoir. The single largest factor for crack sealant failures can be attributed to dirt, dust and/or moisture in the routed reservoir. Their presence greatly reduces or prevents bonding between the sealant and the reservoir walls. The sealant adheres to the dirt instead of a clean, dry surface.

There are other pieces of equipment and/or techniques used for cleaning and dry cracks.

1. Hot Air Blasting
2. Sandblasting (followed by air blasting)

Hot Air Blasting

Hot air blasting is performed with a heat lance connected to an air compressor. The purpose is to provide extreme heat to the crack dissipating the moisture in the crack and improving the potential for bonding.

Its most practical application is drying cracks which are exposed to overnight dew or short rain sprinkles. However, a heat lance should NEVER be used to continue working during a rain shower or when the pavement surface is saturated.

Since heat lances provide extremely high temperatures they can burn the asphalt mix. This destroys the strength and integrity of the asphalt mix that has burned. In other words, ***use heat lances with caution***, or you may create a bigger problem.

CHAPTER 5

OPERATIONAL CONSIDERATIONS

CHAPTER 5 – OPERATIONAL CONSIDERATIONS

Weather Considerations

Weather plays an extremely important role in crack seal operation. A sudden change of weather may adversely effect the project.

The ideal conditions for applying a crack seal are warm temperatures with relatively low humidity, and little or no wind. This is a difficult order to fill in many parts of the state. There are, however, periods when weather patterns are more likely to follow these requirements than at other times. Early spring or late fall brings low temperatures and high wind problems.

Our Standard Specifications require that crack seals be applied when the roadway surface is 35°F and rising. In most cases, between March 1 and December 1, temperature is not a major problem. You must, however, check the surface temperature every morning before any sealant is applied. This is done using an infrared surface thermometer.

Humidity

It is best if the humidity is 50 percent or lower when the sealant is applied. With any asphalt, the lower the humidity the better. High humidity will cause an invisible film of moisture to collect in the cracks, which detract from the sealant sticking properly to the surface. You will often see small bubbles forming and breaking as the air and moisture works it's way to the sealant surface.

Wind

Wind may work partially in your favor and against you at the same time. A gentle wind, if it is constant in speed and direction, can help to cool the sealant sooner. This can reduce some of the potential for tracking problems that usually comes when traffic is applied too soon.

Wind may force a change in plans as to which lane is sealed first, and the direction of work, in order to minimize the effects of loose debris from blowing back into the clean reservoir.

Remember, cold wind will increase heating time in the melter.

Rain

Sealant should NEVER be applied during rain. If rains is in the vicinity and predicted for the area, you should suspend operations until it clears.

Sudden, unexpected showers are common. Sometimes they appear with no warning and pass very quickly. In this case shut off the crack sealing pot immediately and wait until the shower is gone and the cracks dry

After a rain, always suspend operations until the cracks have ample time to dry. Recheck pavement temperatures and be aware of the increased humidity.

Urban Considerations

Traffic Control

A much more extensive traffic control plan is required for crack sealing jobs in urban areas. Side streets entering into the work area need detours and additional personnel for traffic control. Increased traffic volumes require larger storage space for stopped vehicles waiting to be piloted through the work zone and additional pilot vehicles should be considered. Traffic signals at intersections may need to be disabled and flaggers used when the project interferes with normal traffic through intersections.

Cure Time

Traffic turning onto the new sealing job can cause tracking and generally reduce the overall quality of the job. The use of a sealant blotter or material to reduce the sealant's tackiness (i.e., toilet paper, cement, Genzoil, or soap and water) is highly recommended. Be sure to allow enough time with your traffic control for the cracks to cure adequately.

LIST OF GOOD PRACTICES

1. Determine whether a crack seal is the proper strategy for the project.
2. Good preventative maintenance planning.
3. Delegation of key project responsibilities.
4. Communication with the public about the project.
5. Pre-project meeting.
6. Attention to weather factors forecast temperature, humidity, etc.)
7. Good traffic control and flagging operations.
8. Good personal protection, i.e., gloves, ear and eye protection, and long-sleeved shirts.
9. Good routing uniformity; proper depth, width and vertical sidewalls.
10. Clean and dry routed reservoirs.
11. Sealant application temperature met.
12. Good sealant application; flush with pavement surface.
13. Blotter material when needed.
14. Attention to personal safety considerations.

CRACK SEAL CHECKLIST

The following is a checklist of various crack seal considerations. Those options bolded indicate options to avoid. These bolded options could greatly reduce the crack seal life or create a premature failure. If you have several bolded options, you should evaluate what areas to change.

Is this a good crack seal candidate?

- Alligator cracking severity.
a. **severe** b. **moderate** c. minor d. none
- How much alligator cracking is there?
a. 0% b. 0-10% c. **5-15%** d. **>15%**
- Transverse crack width.
a. **<?"** b. $<1/4"$ c. $<1"$ d. **$>1\frac{1}{2}"$**
- Transverse crack spacing.
a. **<10 feet** b. 50 feet c. 100 feet d. >100 feet
- Longitudinal crack width.
a. **<?"** b. $<1/4"$ c. $<1"$ d. **$>1\frac{1}{2}"$**
- Longitudinal crack length.
a. >10 feet b. >100 feet c. >1000 feet
- Block cracking severity.
a. sporadic b. minor c. none
- How much block cracking is there?
a. throughout b. 0% c. 0-10% d. 10-15% e. **>15%**

Environmental Considerations

- Humidity.
a. **raining** b. somewhat humid c. somewhat dry d. dry
- Date of work.
a. before March 1 b. April 1 – Dec. 1 c. **Dec. 1 – March 1**
- Wind.
a. **windy** b. somewhat windy c. somewhat calm d. calm
- Air temperature.
a. **below 35°** b. 65° to 75° c. 75° to 95° d. **above 95°**

5. Surface moisture at the time of treatment.
a. dry **b. mostly dry** c. somewhat wet d. wet
6. Pavement temperature.
a. below 35° b. 65° to 75° c. 75° to 95° **d. above 120°**

Materials/Equipment Considerations

1. Type of sealant.
a. Cold Pour b. Rubberized Hot Pour **c. Liquid Asphalt**
2. Sealant Pot has a full circulatory system?
a. yes **b. no** (unless it has an on-demand system)
3. Sealant temp 360° to 406° F?
a. below b. acceptable **c. above**
4. Compressor
a. above 120# **b. below 120#**
5. Roadway cleanness at the time of treatment.
a. clean b. mostly clean **c. somewhat dirty** **d. dirty**

Technique Considerations

1. Router technique followed?
a. yes b. closely **c. somewhat** **d. no**
2. Were cracks clean?
a. yes **b. usually** **c. sometimes** **d. no**
3. Sealant application uniform?
a. yes b. usually **c. sometimes** **d. no**
4. Foreign materials in the cracks?
a. yes b. no **c. sometimes**
5. Does sealed surface look uniform in appearance?
a. yes **b. no**
6. Time before traffic allowed after sealant has been applied.
a. <30 minutes b. 30 minutes – 1 hour c. 1 –3 hours d. >3 hours
7. Were cracks dry?
a. yes **b. usually** **c. sometimes** **d. no**
8. Traffic kept off until sealant is no longer tacky?
a. yes **b. mostly** **c. somewhat** **d. no**

TROUBLESHOOTING

Problem Encountered	Possible Causes	Possible Solutions
Bubbles in Sealant.	Damaged backer rod. Wrong backer rod.	Change rod installation method or rod diameter. Use proper backer rod for hot-applied sealants
	Moisture in joint. Grass or weeds in joint.	Dry reservoir.
	Bubbles in melter. Moisture present.	Add sealant material. Reduce agitator speed. Slowly heat until water evaporates.
	Air trapped by sealant.	Fill reservoir from bottom.
Sealant is deeply sunken in reservoir.	Rod is slipping into crack. No rod present.	Use proper rod diameter.
Sealant surface is not consistent.	Operator control is poor. Operator movement is uneven. Reservoir width/depth is variable. Inconsistent material temperature.	Use a nozzle with a depth control plate. Use a wand with a shutoff at the nozzle. Use an experienced operator.
Sealant is not sticking to routed reservoir walls.	Reservoir walls are not clean.	Remove all old sealant, oil, dust, dirt, sawing slurry, and other contaminants.
	There is moisture on the walls from rain, dew, or condensation.	Wait for pavement to dry. Use a heat lance if slightly damp. Use an air compressor with a moisture trap.
	Sealant temperature is too low.	Maintain recommended sealant temperature.
	Pavement temperature is too low.	Wait until warm.
Sealant remains tacky after installation.	Kettle is contaminated with heat transfer oil, solvent or other sealant.	Remove sealant. Replace with uncontaminated sealant.
	Sealant has been overheated or heated too long.	Remove and replace with fresh sealant. Check melter temperatures.

CHAPTER 6

TRAFFIC CONSIDERATIONS

CHAPTER 6 - TRAFFIC CONSIDERATIONS

We recommend that one person be in charge of a crew whose sole responsibility is traffic control. Their duties include placing and moving temporary signs, flagging and piloting operations (if necessary).

Any permanent signs that are in conflict with the project must be covered until the project is complete.

Sign Setup

The first priority prior to start-up should be the correct positioning of the signs. The timing is critical so motorists are adequately warned before any equipment is moved onto the highway. Be sure there is an adequate storage for stopped vehicles during normal operations. Crack seal work zones are limited to three-kilometer (1.8 miles) work areas.

Check to ensure that all signs specified in the Traffic Control Plan and/or Zone Safety Guideline handbook are:

- 48”;
- in good condition;
- in the proper sequence;
- the correct distance apart;
- clearly visible to motorists;
- positioned correctly so the devices themselves do not pose a hazard to traffic; and
- FHWA has indicated that you may place a cone by the sign to help draw attention to the sign.

Flagger

As soon as the flagger sign is placed in position, a flagger should also be in position. You should ensure the flagger is using the correct signals. If the flagger is required to verbally explain the situation to vehicle operators, listen to what he or she tells a few of the drivers to make sure it is clear and accurate.

If there are flaggers at both ends of the project, which there usually are on a two-lane road, make certain they have whatever communication tools are necessary. Also, check that the communication tools are being properly used.

18” x 18” Stop/Slow paddle with 6” letters.

Always remember that the flaggers are vital to the safety of motorists and workers in the construction area. If they are not performing any element of their duties properly, they must be corrected promptly. Refer to the MDT flagger manual for proper flagging attire and requirements.

Intersection

If the crack seal operation crosses any intersections, extreme care must be taken. Be sure the traffic control plan is followed; you may need additional signs and flaggers at the intersection. Care must be taken to prevent vehicles from crossing the hot sealant.

Pilot Car

To determine if pilot cars are required, consider the following factors:

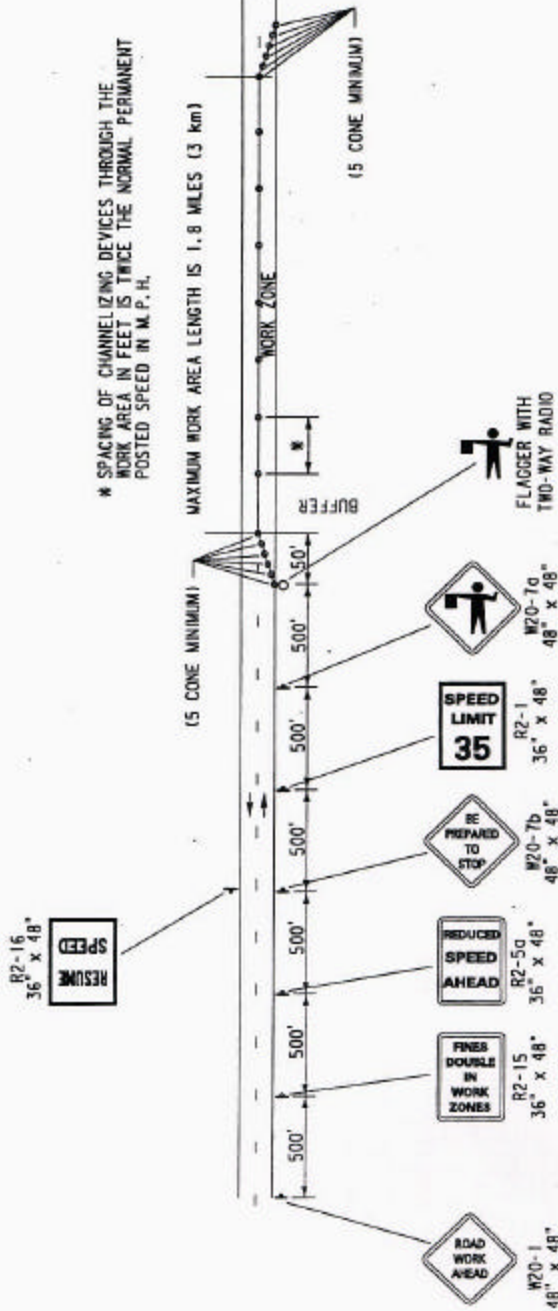
- ADT
- roadway width
- length being piloted
- man power availability
- number of major intersections
- adequate communication
- time stopped at a flagger station (15 minutes or less)

If you have any questions about the correct signs or spacing, consult:

- Maintenance Work Zone Guidelines (next 2 pages)
- MUTCD
- Traffic Engineer

POINTS OF 61-8-314, MCA:

- ① CONSTRUCTION ZONE MAY INCLUDE A WORK ZONE.
- ② SIGNS IDENTIFY THE BOUNDARIES OF EACH.
- ③ SEPARATE SPEEDS CAN BE SET FOR EACH
- ④ DOUBLE PENALTY SIGN MUST BE AT CONSTRUCTION ZONE BOUNDARY.
- ⑤ DOUBLE PENALTY APPLIES TO WORK ZONE.
- ⑥ WORK ZONE CANNOT EXCEED ACTUAL ACTIVITY AREA BY MORE THAN 500'.

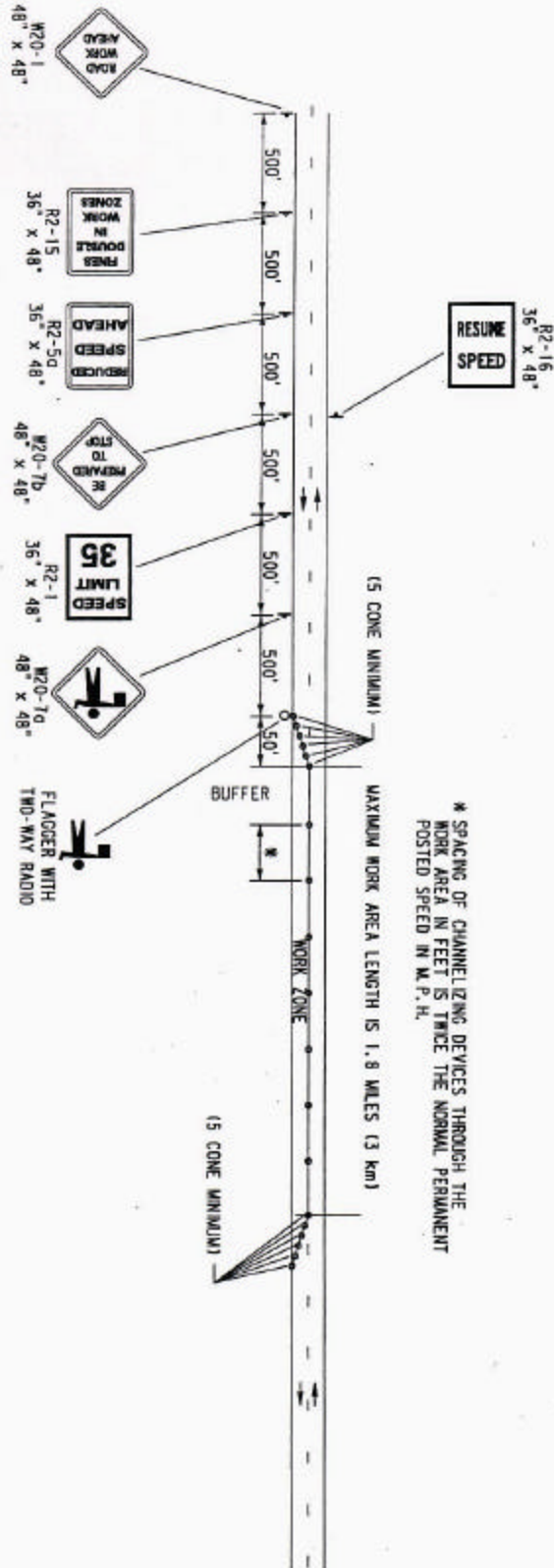


- NOTES:
- ON ROADWAYS WITH HIGH TRAFFIC VOLUMES OR VISIBILITY RESTRICTIONS A 500' SPACING FOR ALL SIGNS IS RECOMMENDED.
 - IF A NEED ARISES TO INCREASE VEHICLE STORAGE, ADD AN ADDITIONAL W20-7a "FLAGGER AHEAD" SIGN BETWEEN THE R2-1 AND THE ORIGINAL W20-7a AND CONSIDER AN ADDITIONAL FLAGGER AND STATION.
 - A MIRROR IMAGE OF THIS SIGN SEQUENCE IS REQUIRED FOR THE TRAFFIC FROM THE OPPOSITE DIRECTION.
 - PLACE THE RESUME SPEED SIGN OPPOSITE TO THE BE PREPARED TO STOP SIGN FOR TRAFFIC LEAVING THE WORK ZONE.
 - FOR MORE INFORMATION OR CLARIFICATION CONTACT THE DISTRICT TRAFFIC ENGINEER. FOR EXAMPLE, IF WORK ZONE IS CLOSE TO A HORIZONTAL CURVE, A VERTICAL CURVE, A BRIDGE, INTERCHANGE, POOR SIGHT DISTANCE OR OTHER SPECIAL CONDITION.
 - COVER ANY CONFLICTING SIGNS IN THE WORK ZONE.
 - SHORT-TERM WORK ZONE SIGNING IS NOT REQUIRED TO BE POST MOUNTED.

DETAILED DRAWING	DWG. NO.
REFERENCE STANDARD SPEC.	
MAINTENANCE GUIDELINE FOR SHORT-TERM TWO-LANE CRACK SEALING WORK ZONE	
EFFECTIVE	
MONTANA DEPARTMENT OF TRANSPORTATION	

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* SPACING OF CHANNELIZING DEVICES THROUGH THE WORK AREA IN FEET IS TWICE THE NORMAL PERMANENT POSTED SPEED IN M.P.H.

- NOTE:
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MONTANA DEPARTMENT OF TRANSPORTATION MONTANA CAD	

APPENDIX A

GLOSSARY OF TERMS

APPENDIX A – GLOSSARY OF TERMS

Abrasion – The wearing away of treatment material by tire friction or snowplow scraping.

Adhesiveness – The ability of a material to remain bonded to crack sidewalls and/or pavement surface.

Band-Aid – An overband configuration where material is shaped/finished to desired dimensions.

Capped – An overband configuration where material is not shaped/finished. The material is allowed to level over the crack channel by itself.

Cohesiveness – The ability of a material to resist internal rupture.

Cost-Effectiveness – The degree to which a treatment is both useful and economical.

Crack Channel – The crack cavity as defined by either the original (uncut) crack or cut crack.

Crack Repair – Maintenance in which badly deteriorated cracks are repaired through patching operations.

Crack Reservoir – A uniform crack channel resulting from routing operations. Generally rectangular in shape.

Crack Treatment – Maintenance in which cracks are directly treated through sealing or filling operations.

Cupping – A depression in the pavement profile along crack edges caused by damaged or weakened sublayers.

Edge Deterioration – Secondary cracks and spalls that occur within a few inches of the edges of a primary crack.

Elasticity – The ability of a material to recover from deformation and resist intrusion of foreign materials.

Faulting – A difference in elevation between opposing sides of a crack caused by weak or moisture-sensitive foundation material.

Flexibility – The ability of a material to extend to accommodate crack movement.

Incompressible – Material, such as sand, stone, and dirt, that resists the compression of a closing crack channel.

Lipping – An upheaval in the pavement profile along crack edges. Lipping may be the result of bulging in underlying PCC base or the infiltration and buildup of material in the crack.

Longitudinal – Parallel to the centerline of the pavement or laydown direction.

Non-Working (cracks) – Cracks that experience relatively little horizontal and/or vertical movement as a result of temperature change or traffic loading. As a general rule, movement less than 0.1 in. (2.5 mm).

Overband – A type of finish in which material is allowed to completely cover crack channel by extending onto pavement surface. Overbands consist of band-aid and capped configurations.

Secondary Crack – A crack extending parallel to and/or radially from a primary crack. A form of edge deterioration.

Transverse – Perpendicular to the pavement centerline or direction of laydown.

Treatment Effectiveness – The degree to which a treatment is performing its function.

Treatment Failure – The degree to which a treatment is not performing its function.

Working – Cracks that experience considerable horizontal and/or vertical movement as a result of temperature change or traffic loading. In general, movement greater than or equal to 0.1 in. (2.5 mm).

APPENDIX B

CONTRACT AND INSPECTION FORMS

**MONTANA DEPARTMENT OF TRANSPORTATION
REQUEST FOR QUOTATION**

PURCHASING SERVICES BUREAU
2701 Prospect Avenue
PO Box 201001
Helena, MT 59620-1001
Phone: (406) 444-7226
June 18, 2002

THIS IS NOT AN ORDER

(Contractor label here)
Sealing

BID NO: #HWY-
BID TITLE: Routing and Crack
PAGES: 1 of 13

SEALED BIDS will be received and
publicly opened in Room #173
at 3:00 p.m. on:

ATTACHMENTS _____

ISSUED BY:

RETURN BID IN SEALED ENVELOPE MARKED AS SHOWN:

#HWY-
Purchasing Services Bureau
Montana Department of Transportation
PO Box 201001
Helena, MT 59620-1001

IF NO BID RESPONSE . . .

- Take me off the contractor list for this item.
- Keep me on the contractor list for future bids.
- Other: _____

PLEASE COMPLETE

Project Completion Date: _____
Company Name: _____

Payment Terms: Net 30 Days
Phone: () _____

Printed Contractor Name: _____ Fax: () _____
Signature of Contractor: _____
Federal Tax ID Number: _____

IMPORTANT: SEE REVERSE SIDE FOR TERMS AND CONDITIONS

BILL TO: DEPT OF TRANSPORTATION

PROJECT SITE:

Questions may be directed to _____ at (406) _____ in _____. However, any changes to the requirements of the Request for Quotation (RFQ) can only be made by the Montana Department of Transportation (Department) in writing, and claimed oral modifications are not valid or binding.

I. GENERAL INFORMATION AND REQUIREMENTS

A. FEDERAL AID REQUIREMENTS

1. Since Federal Aid Funds will be utilized to pay for this project, the Montana bid preferences will not apply.
2. Prevailing Wage will be in accordance with the attached FHWA form #1273 and current Davis-Bacon wage rates.
3. DBE GOAL: A 0% DBE goal was set for this project. DBE certified Contractors would be encouraged through the following:

Serious consideration of utilizing the Department's currently certified DBE firms, should subcontracting of certain services be deemed necessary by the prime Contractor.

B. BID SECURITY

Each bid/proposal must be accompanied by Security as described in Section 18-1-201, made payable to the Department. The security shall be in an amount of not less than 10% of the total bid, in the form of a Bid Bond executed by a Surety Corporation authorized to do business in the state of Montana, must be on the form provided herein by the Purchasing Services Bureau. THIS IS THE ONLY TYPE OF SECURITY ACCEPTABLE AND MUST BE IN ORIGINAL FORM. FACSIMILE OR PHOTOCOPIES ARE NOT ACCEPTABLE.

A bidder failing or refusing to enter into any awarded contract or purchase order within the required ten (10) working days following the Purchasing Services Bureau's issuance of confirmation of award shall forfeit the bid security. See Section 18-1-204(1), MCA. "Enter into any contract or purchase order" includes execution of the contract, submission of acceptable performance security, and submission of any required liability insurance coverage and workers' compensation insurance coverage or exemption.

C. CONTRACT PERFORMANCE SECURITY

The successful Contractor must provide contract performance security based on 100% of the contract total to guarantee the complete, faithful performance of the contract and the payment of all laborers, suppliers, mechanics, and subcontractors. Upon Purchasing Services Bureau's receipt of the contract performance security, the contract/purchase order will be forwarded to the successful Contractor. The contract performance security must be provided by the successful Contractor on the form provided by the Purchasing Services Bureau to the Bureau within ten (10) working days from the date of the Confirmation of Award. A sufficient bond with a licensed surety company as surety is the only type of

security acceptable and MUST BE IN ORIGINAL FORM. FACSIMILE OR PHOTOCOPIES ARE NOT ACCEPTABLE.

The security must remain in effect for the entire contract period, including any extensions.

Ref: MCA Title 18, Chapter 4, Part 3; ARM, Title 2, Chapter 5, Sub-Chapter 5.

D. INSURANCE REQUIREMENT

Certificates of Insurance, indicating compliance with the required coverages, must be filed with the Purchasing Services Bureau within ten (10) working days of notice of award. The proof of insurance/exemption must be valid for the entire contract period.

Contracts **WILL NOT** be issued to Contractors that fail to submit insurance certifications as specified herein.

- 1) Proof of Workers' Compensation Insurance valid within the State of Montana or proof of exemption thereof.
- 2) Proof of commercial general liability, including automobile liability, with limits of not less than \$1,000,000 per occurrence.

This certificate **MUST** name the Department as an additional insured under the Contractors' policy including the Contractor's general supervision, products, premises and automobiles used.

E. CONTRACTOR LICENSE AND REGISTRATION

Effective July 1, 1996, Montana law requires all construction Contractors to register with the Montana Department of Labor. Because this is a federal funded project, Contractors must register prior to executing a contract. For information regarding this requirement, contact the Department of Labor at 1-406-444-7734.

If you have a Contractor Registration Number, list it here: _____

Section 15-50-206, MCA requires the state agency or Department for whom a public construction work contract over \$5,000 is being performed, to withhold one percent (1%) of all payments and to transmit such monies to the Department of Revenue.

F. AUTHORITY TO DO BUSINESS

Any business entity, domestic or foreign, intending to transact business in Montana must apply for authority to do so with the Montana Secretary of State. Foreign business entities are obligated to determine whether they are transacting business in Montana, in accordance with §§ 35-1-1026 and 35-8-1001, MCA, and if so, must apply for and receive a certificate of authority and continue to be in good standing with the Secretary of State for the duration of this contract. Violation of these requirements may void this contract. Proof of authority is required. Questions or registration may be accomplished by contacting the Secretary of State at (406) 444-3665 or by e-mail at sos@state.mt.us.

G. VENUE

In the event of litigation over this RFQ or the agreement resulting from it, venue shall be in the First Judicial District in and for the County of Lewis & Clark, Montana, and the documents shall be interpreted according to the laws of Montana.

H. RECORDS

Contractor agrees to provide the Department, the Legislative Auditor or their authorized agents access to any records concerning this Agreement.

Contractor agrees to create and maintain all records supporting the services rendered for a period of 3 years after the completion date of the Agreement or the conclusion of any claim, litigation, or exception relating to this Agreement taken by the Department or the third party.

I. HOLD HARMLESS/INDEMNIFICATION

Contractor agrees to defend, protect, indemnify and save harmless the State of Montana and Department against and from all claims, liabilities, demands, causes of action, judgments (including costs and reasonable attorneys fees), and losses to them from any cause whatever (including patent, trademark and copyright infringements) from the Agreement and its execution. This includes any suits, claims, actions, losses, costs or damages of any kind, including the State's and Department's legal expenses, arising out of, in connection with, or incidental to the Agreement, but does not include any such suits, claims, actions, losses, costs or damages which are solely the result of the negligent acts, omissions or misconduct of Department's employees if they do not arise out of, depend upon or relate to a negligent act, omission or misconduct of Contractor's employees. The Contractor assumes all responsibility for ensuring and enforcing safe working conditions and compliance with all safety-related rules and regulations for the benefit of its own employees, the employees of any subcontractor, and the public. That responsibility includes all duties relating to safety, regardless of whether any such duties are, or are alleged to be, "nondelegable" (e.g., the Montana Safe Place to Work Statute, etc.). This indemnification is expressly intended by the parties to include any claims, liabilities, demands, causes of action, judgments (including costs and reasonable attorneys fees), and losses that are, or are alleged or held to be, based upon a breach by the Department of a nondelegable duty relating to workplace safety for the Contractor's employees, the employees of any subcontractor, and the public.

J. ASSIGNMENT AND TRANSFER

The Contractor shall not subcontract or assign its obligations under this contract without prior written consent of the Department and, if such subcontracting is approved, all requirements of the contract shall be binding to the subcontractor.

K. CODE AND PERMIT REQUIREMENTS

Successful Contractor agrees that all work performed as a result of award of the project detailed herein shall meet or exceed all applicable city, county, state and federal codes. Failure to research said codes will not relieve the successful Contractor of his/her responsibility regarding code compliance. The Contractor shall be responsible for all required permits, licenses, fees and inspections associated with the project.

L. PROJECT SITE

Each Contractor should visit the job site to verify measurements and to become fully aware of the conditions relating to the project and the labor requirements. Failure to do so will not relieve the successful Contractor of his/her obligations to furnish all materials and labor necessary to carry out each provisions of this contract.

Contractor shall adequately protect the project site, adjacent property and the public in all phases of the work. The Contractor shall be responsible for all damages or injury due to his/her action or neglect.

The Contractor shall allow the Department access to the Project.

M. UNSATISFACTORY WORK

Work rejected by the Department as unsatisfactory shall be corrected by the Contractor prior to final inspection, acceptance and payment.

Contractor shall immediately proceed to remedy listed defects within seven (7) calendar days after Notice of Observed Defects has been issued by the Department.

Should the Contractor fail to respond to the Notice of Observed Defects or not remedy the defects, the Department reserves the right to have unsatisfactory work corrected at the expense of the Contractor.

Nothing herein stated shall obligate the Contractor to remedy defects caused by the Department's abuse of that work.

N. CONFIRMATION OF AWARD/NOTICE TO PROCEED

After award has taken place, the successful Contractor will receive a "Confirmation of Award" letter from the Purchasing Services Bureau. The "Confirmation of Award" letter is not authorization to proceed with the project.

The purpose of the letter is to notify the Contractor that he/she must secure (a) proof of workman's compensation insurance coverage or exemption, (b) proof of liability insurance coverage and (c) contract performance security; and that these documents must be received by the Purchasing Services Bureau, 2701 Prospect Avenue in Helena before a "Notice to Proceed" with the project can be given.

Upon receipt by the Purchasing Services Bureau of the Contractor's proof of insurance and contract performance security, a purchase order will be officially signed. Receipt of the signed original purchase order by the Contractor shall be the Department's official "Notice to Proceed" with the project.

O. CIVIL RIGHTS

NOTICE TO CONTRACTOR

During the performance of this Agreement, the Contractor, for itself, its assignees and successors in interest, agrees as follows:

A) COMPLIANCE WITH TITLE VI OF THE CIVIL RIGHTS ACT OF 1964 FOR FEDERAL-AID CONTRACTS

- (1) Compliance with Regulations: The contractor shall comply with all Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation, 49 Code of Federal Regulations, Part 21, as they may be amended (hereafter referred to as the Regulations), which are incorporated by reference and made part of this Agreement, even though only State funding is here involved.
- (2) Nondiscrimination: The Contractor, with regard to the work performed by it during the Agreement, shall not discriminate on the grounds of sex, race, color or national origin in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by 49 CFR §21.5.
- (3) Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, whether by competitive bidding or negotiation by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, any potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this Agreement and the Regulations relative to nondiscrimination.

- (4) Information and Reports: The Contractor will provide all reports and information required by the Regulations, or directives issued pursuant thereto, and permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the Department or the Federal Highway Administration (FHWA) to be pertinent to ascertain compliance with Regulations or directives. Where any information required of the Contractor is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Department of the FHWA as requested, setting forth what efforts it has made to obtain the information.
- (5) Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Agreement, the Department may impose sanctions as it or the FHWA determines appropriate, including, but not limited to;

(a) withholding payments to the Contractor under the Agreement until the contractor complies, and/or

(b) cancellation, termination or suspension of the Agreement, in whole or in part.

- (6) Incorporation of Provisions: The Contractor will include the provisions of paragraphs (1) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The Contractor will take such action with respect to any subcontract or procurement as the Department or the FHWA may direct to enforce such provisions including sanctions for noncompliance: Provided; however, that in the event the Contractor is sued or is threatened with litigation by a subcontractor or supplier as a result of such direction, the Contractor may request the Department to enter into the litigation to protect the interests of the State, and, in addition, the Contractor or the State may request the United States to enter into such litigation to protect the interests of the United States.

B) COMPLIANCE WITH THE MONTANA GOVERNMENTAL CODE OF FAIR PRACTICES, 49-2-207, MCA

In accordance with 49-3-207, MCA, the Contractor agrees that for this Agreement all hiring will be made on the basis of merit and qualifications and that there will be no discrimination on the basis of race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin by the persons performing the Agreement.

C) COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA)

- (1) The Contractor will comply with all regulations relative to implementation of the AMERICANS WITH DISABILITIES ACT (ADA).
- (2) The Contractor will incorporate or communicate the intent of the following statement in all publications, announcements, video recordings, course offerings or other program outputs:

“The Contractor will provide reasonable accommodations for any known disability that may interfere with a person participating in any service, program or activity offered by the Contractor. In the case of documents, recordings, or verbal presentations, alternative accessible formats will be provided. For further information call the Contractor.”

- (3) All video recordings produced and/or created under this Agreement will be closed captioned.

D) COMPLIANCE WITH PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES IN DEPARTMENT OF TRANSPORTATION FINANCIAL ASSISTANCE PROGRAMS, 49 CFR §26

Each Agreement the Department signs with a Contractor (and each subcontract the prime contractor signs with a subcontractor) must include the following assurance:

“The Contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

P. DIESEL FUEL TAX

Pursuant to 15-70-310 through 336, MCA, the Contractor, any subcontractor or anyone using diesel fuel in motor vehicles, motorized equipment or the internal combustion of any and all engines, including stationary engines, is required to comply with the "special fuel use tax."

This requirement applies to all diesel fuel used in connection with work performed on construction, reconstruction or other improvements on highways, streets or within public right-of-way as a result of any contract awarded by a public agency.

Questions on this provision may be addressed to:

FTMA Bureau
Administration Bureau
Department of Transportation
P.O. Box 201001
Helena, MT 59620-1001

Motor Fuels Information: (406) 444-0806

Q. DEBARMENT

The Contractor certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction (contract) by any governmental Department or agency. The Contractor certifies that it is in no way dealing with a person or entity that is presently debarred or suspended by the State of Montana or the Federal government. If the Contractor cannot certify this statement, attach a full written explanation for review by the state.

R. PRECONSTRUCTION CONFERENCE

A mandatory preconstruction conference will be held between the Contractor and Department personnel. This conference will be held a minimum of 5 working days prior to the start of work. Scheduling for days and hours worked will be set at that time. The Department will designate a project manager at this conference. The project manager will be the authorized agent for the Department on this project. The Helena Maintenance Review Section personnel will be considered as inspectors when on the job site.

S. CONTRACT TIME

Contract time will be determined as follows:

Designated Contract Date -- will be the actual calendar date by which all work under the contract shall be completed.

CONTRACT INFORMATION

PROJECT SITE: _____
ROUTE: _____
MILEPOST: _____
LOCATION: _____

II. SPECIFICATIONS FOR WORK

Provide all labor, materials, equipment, traffic control and incidentals necessary to crack seal _____ kilometers (_____ miles) of road on route _____. Average roadway width is _____ meters (_____ feet). Cracks shall be routed and sealed per the special provisions.

CONTACT PERSON: _____ PHONE NUMBER: _____ (406) _____
DESIGNATED CONTRACT DATE: _____ Work is Required to be completed on or before _____

SPECIAL PROVISIONS

1. CRACK SEALING

A. Description

This work consists of routing, cleaning and sealing the transverse and specified longitudinal cracks meeting the dimensions specified under D(1)(a) in the roadway surface with the specified sealant. All quantities referenced herein are estimated quantities.

B. STANDARD SPECIFICATIONS

All references to the "Standard Specifications" shall be the Department's book entitled "Standard Specifications for Road and Bridge Construction", 1995 edition, **or as amended by current supplemental specifications.** Current supplemental specifications may be obtained at the following web site: mdt.state.mt.us/contract/stdspec_sup.pdf

- (1) The following Standard Specifications Sections apply in their entirety:
 - a. Section 101

- (2) The following Standard Specifications Articles apply in their entirety:
 - a. 102.02, 102.04, 102.05 and 102.06
 - b. 105.01, 105.06, 105.07, 105.09, 105.10, 105.11 and 105.16
 - c. 107.01, 107.02, 107.03, 107.04, 107.05, 107.06, 107.07, 107.10, 107.11, 107.12, 107.14, 107.15, 107.16, 107.17, 107.18, 107.20 and 107.21
 - d. 108.01, 108.04, 108.05, 108.06, 108.08, 108.09 and 108.10
 - e. 109.01 and 109.08

- (3) The following portions of Standard Specification Articles shall apply:
 - a. 104.02.1 and 104.02.3
 - b. 105.05 replace 1st sentence with the following: The Department will furnish the Contractor with 1 set of contract documents.
 - c. 105.12 (reference to 105.03 is to 105.03.1 only)
 - d. 618.03.1, 618.03.2, 618.03.3, 618.03.4, 618.03.5, 618.03.13, 618.03.14, 618.03.15 and 618.03.16

C. Materials

1. Crack Sealant

Use sealant meeting the following ASTM D 5167 specifications:

Cone Penetration, 77°F (25°C), dmm (ASTM D5329)	100-150
Cone Penetration, 0°F (-18°C), dmm (ASTM D5329 modified)	25 min.
Flow, 140F (60°C), 5h (ASTM D5329).....	10mm max.
Resilience, (ASTM D5329).....	30-60%
Bond, -20°F (-29°C), 200% ext. (ASTM D5329).....	Pass 3 cycles
Recommended Pour Temperature.....	380°F (193°C)
Safe Heating Temperature	410°F (210°C)
Asphalt Compatibility (ASTM D5329)	Pass

Three (3) known supplier products meeting these requirements are:

- Crafco 522
- Maxwell Elastoflex 72
- Crackfiller Mfg. CMC-101-ELT-B4135

Submit a 13.6 kg (30 lb.) sample from the first lot of the sealer proposed for project use to the Helena Materials Bureau for testing at least 20 calendar days before its intended application. Contractor must provide a copy of the lot approval form from the Department’s materials lab prior to start of work.

The Department will take one random sample from each lot for testing. The Department may take random samples at any time during the project.

2. Backer Rod

- a) Furnish backer rod meeting ASTM D-5249, Type 1, sized for cracks meeting D,(3)(a).

D. Construction Requirements

1. Routing

- a) Rout all cracks between 3 mm (.118") and 25 mm (.984") wide.
- b) Rout the cracks to produce straight 10 mm (.393") vertical walls and a 40 mm (1.575") wide flat bottom reservoir meeting the crack seal detail elsewhere in the contract.
- c) On new chip seals rout the cracks to produce straight 12.5 mm (.492") vertical walls and a 40 mm (1.575") wide flat bottom reservoir.
- d) Rout when the roadway is dry.
- e) Remove and dispose of the routed material from the roadway before opening the roadway to traffic.

2. Cleaning

- a) Ensure the reservoir and crack are dry and free of dust, dirt and loose materials immediately before placing the backer rod, if applicable, and applying the sealant. Use air equipment producing at least 125 CFM and line pressure of at least 125 PSI.

3. Sealing

- a) Install Backer Rod in cracks 40 mm (1.575") wide and larger.
- b) Place sealant material within 72 hours of routing.
- c) Follow the sealant manufacturer's handling, mixing and application temperature requirements.
- d) Apply sealant filling the reservoir flush to the top using a pressure type applicator.
- e) Open the completed work to traffic once the sealant will not track.
- f) Repair or replace all seal work damaged by traffic at Contractor expense.
- g) Blotter material must be approved by Maintenance Chief prior to start of work.

4. Temperature Limitations

- a) Do not rout when the mat temperature is below 2°C (35.6°F).
- b) Apply the sealant when the roadway surface temperature is between 2°C (35.6°F) and 49°C (120.2°F).

5. Work Hours/Proposed Work Schedule

- a) Prior to commencement of work, the Contractor shall submit a written proposed work schedule that accommodates the contract dates, to the Maintenance Chief. The Maintenance Chief may request changes to the schedule to best meet the needs of the Department as long as the changes do not impact the sequence of work or designated contract date to the point it changes the terms of the contract as bid. Once the schedule is approved by the Maintenance Chief and concurred with by the Contractor, subsequent changes to the schedule must be approved in writing by both the Maintenance Chief and the Contractor.

If the Contractor is unable to complete the work by the designated contract date for reasons beyond his control, such as inclement weather, he may request a change to the designated contract from the Maintenance Chief. Such request shall be in writing and shall state the reasons for the request.

- b) The Maintenance Chief will review the request and will provide the Contractor with a written response indicating approval, in which case a new designated contract date will be provided, or disapproval with appropriate reasons. If the Contractor is dissatisfied with the Maintenance Chief's response, he may appeal the decision to the District Administrator. The District Administrator's decision is final.
- c) The Contractor shall not work on Saturdays and Sundays unless specifically approved in writing by the Maintenance Chief.
- d) In the event the Contractor does not complete the work by the designated contract date, liquidated damages will be assessed in the form of a daily charge for each day, except Saturdays, Sundays and legal holidays that exceed the designated contract date. The daily charge will be determined from the schedule in Standard Specification Article 108.08 under fixed date. This charge will be deducted from money due the Contractor.

6. General

- a) Work one-half of the roadway at a time. Working full width of the roadway will require the Contractor to submit a written request (complete with traffic control plan) to the Maintenance Chief prior to the start of work. The Maintenance Chief will respond to this request in writing within 5 working days.
- b) Limit routing and crack sealing work to one maximum three-kilometer (1.86 miles) work area.
- c) Adequate personnel and support equipment shall be available to ensure an efficient operation .

E. Basis of Payment for Crack Sealing

Crack sealing will be paid for by the lineal meter of sealed cracks. This quantity will be paid for at the contract unit price and will be full compensation for all resources necessary to complete that item of work.

The quantities listed herein are estimates only and may increase or decrease as necessary. However, at no time will they increase in excess of 125% or decrease below 75% of the original contract quantity.

F. Traffic Control and Sequence of Operations

1. Traffic Control

The Contractor will present, to the Maintenance Chief for his/her approval, a traffic control plan and the sequence of operations. The traffic control plan must be in accordance with MUTCD and State of Montana House Bill 99.

Effective July 1, 2001, all flaggers must be certified and carry a Montana observed certification card. Flaggers must present their certification card to the project manager prior to the start of work.

2. Sequence of Operations

The Contractor will schedule crack sealing/traffic control operations in a sequence to provide the least amount of inconvenience possible to the traveling public. One-way traffic will be permitted during daylight hours only. All traffic will be returned to two-way traffic at night. On Interstate projects overnight lane closures will not be permitted.

3. Basis of Payment for Traffic Control

Traffic control shall be paid for on a lump sum basis. No adjustment to the contract lump sum price will be allowed during the execution of the contract.

G. Basis of Payment for Mobilization

Mobilization shall be paid for on a lump sum basis. No adjustment to the contract lump sum price will be allowed during the execution of the contract.

III. AWARD PROCESS

Award will be made to one (1) Contractor whose low bid meets all terms, conditions, requirements and specifications of Request For Quotation #HWY- .

The prospective Contractor may take "exception" to the bid terms, conditions, requirements or specifications as stated; or, the prospective Contractor may submit an "alternate" proposal. However, the Department reserves the right to disqualify any or all bids submitted which include either "exceptions" or "alternates." Additionally, the Department reserves the right to reject any or all bids, if rejection is deemed to be in the Department's best interest.

The Department also reserves the right to cancel the project referenced herein if cancellation is deemed to be in the Department's best interest.

IV. QUOTE SECTION

QUANTITY SHEET
FOR
CRACK SEALING

<u>Item & Description</u>	<u>Unit Of Measure</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
Mobilization	Per L.S.	1.0		\$

PRECONSTRUCTION MEETING TOPICS

The following is list of suggested topics for the Preconstruction meeting with the Contractor. The Preconstruction meeting is a requirement of the Crack Sealing Contract and must be held at least 5 days prior to the commencement of work:

- Designate Department and Contractor's Project Managers for the project
- **Authority of Department's Project Manager**
- EEO and ADA Requirements
- **Ensure all the required permits have been obtained by the Contractor**
- Work shifts and schedules (Holidays)
- Start date
- Contract Specifications for Work and Special Provisions (overruns/underruns)
- **Work Quality Issues**
- Lineal Meter Measurement
- Unsatisfactory Work
- Designated Contract Date
- Material Testing/Certification/Sampling
- Backer Rod Requirements and Blotter Material
- Routing Requirements and Material Tracking
- RWIS Sites
- Temperature Limitations and Road Surface Requirements
- Work Zones (Moving Work Zones)
- Stockpiling of Materials
- Melter Material Temperature
- Air Equipment CFM & PSI
- Waste Disposal
- Diesel Fuel
- Number of working days and exceptions
- Traffic Control Operations, Flagger certification
- Dispute resolution
- Safety Meeting (Hard Hats, Vests, Etc)
- Centerline
- Restrooms

MONTANA DEPARTMENT OF TRANSPORTATION

CRACK SEAL QUANTITY FORM

DATE: _____ **PROJECT NUMBER:** _____

PROJECT LOCATION: _____ **ROUTE:** _____

BEGINNING MILEPOST: _____ **ENDING MILEPOST** _____

It is hereby agreed that this day a total of _____ lineal meters of cracks were sealed. The day's production started at approximately _____ Milepost and at ended at _____ Milepost.

Note: To convert from feet to meters multiple by .3048. Example (30 feet x .3048 = 9.144 meters)

(Contractor's Representative)

(State Representative)

Montana Department

Sampling Procedure _____

(Rev. 5-99)

of Transportation Materials Bureau 2701 Prospect Ave. Helena, MT 59620-1001

Testing Methods _____

Miscellaneous Samples Submitted From Field

Div. Lab No. _____

Hel. Lab No. _____ Sample No. 1 (Lot 1) Cost Center # _____

Termini Philipsburg-Maxville

Date Sampled 6-23-99 Date Rec'd _____ Quantity 44,000 lbs.

Sampled by John Brown Title ET 1 Address Bozeman

Submitted by Pete Johnson Title EPM Address Bozeman

Sta. and/or Lab No. 41+20 - 102+60

Name of Material Elastoflex

To be Used for Crack Sealant

Contract Item No. 402020478

Grade/Type Elastoflex 72 Trade Name Elastoflex Batch/Cert. No. Lot 905184

Manufacturer Maxwell Products Address Salt Lake City, Utah

Jobber Bonneville Asphalt and Repair Address Orem, Utah

Sample Submitted: Yes No

Acceptance Based On: Test Results Attached Certification

Other (Specify) _____

Helena Distribution:

- _____ District Eng. _____
- _____ Dist. Matls. Supvr. _____
- _____ Area Lab _____
- _____ Mgr.Fld. Proj. _____
- _____ Maint. Div. _____
- _____ Const. Bur. _____
- _____ Pre-Constr. Bur. _____
- _____ County File _____
- _____ _____ Helena

Lab File

Dist./Area Dist.:

- _____ Materials Bureau
- _____ Constr. Bureau
- _____ Area Lab _____
- _____ Area Lab _____
- _____ Mgr. Field Proj. _____
- _____ _____
- _____ Sample

Checked	Date	Name
and	_____	_____
Approved	_____	_____

Materials Bureau

Dated _____

INSPECTOR'S FIELD DIARY

PROJECT NO. _____

DATE: _____

PERSONNEL _____

WEATHER _____

TEMP: LOW _____ HIGH _____

SHIFT TIME:FROM _____ TO _____

EFFECT OF WEATHER ON PROGRESS _____

CONTRACTORS GENERAL OPERATION _____

CONTRACTORS PERSONNEL AND EQUIPMENT _____

ITEMS INSPECTED _____

QUANTITY INSPECTED _____

TEST RESULTS ON ITEMS INSPECTED _____

STATIONING OF ITEMS INSPECTED _____

PROBLEMS ENCOUNTERED _____

DIRECTIVES GIVEN CONTRACTOR _____

OTHER PERTINENT INFORMATION _____

INSPECTOR'S SIGNATURE:

TITLE _____