## 9.70 PCC PATCHING

Full and partial depth PCC patches can be broken down into two general types; finish and repair patches. Finish patches are intended to be the final driving surface of a roadway whereas repair patches are typically used when a roadway is going to be resurfaced. The primary difference between finish and repair patches is that finish patches require sealing of joints and repair patches do not require sealing of joints.

## 9.71 FULL-DEPTH PCC PATCHES

Details for full-depth PCC patches vary depending upon the existing pavement that is to be patched. The RR *Standard Road Plans* show details for full-depth patching of each of the various pavement types. Standards that apply to a project will be identified in the Tabulation of Road Standards in the project plans.

Patches are tabulated in the Tabulation of Full-Depth Patches, Tab 102-6C in the project plans. This tab is very important because it provides details about the patches including location, size, and thickness. Typically patching tabulations are put together several months before a project is let. It is not uncommon for the roadway condition to change after the patch tab is generated and before patching begins. This often results in changes in location, quantity, and size of patches. For this reason, patching quantities in project plans are increased to account for overruns.

### Materials

Full-depth PCC patches are typically placed using an M mix with Calcium Chloride (CaCl). The CaCl is an accelerator that helps the concrete gain strength very rapidly and allow early opening to traffic. However, along with the rapid strength gain, the mix will also experience very rapid slump loss and decreased workability. Because of the rapid loss of workability, it is important that the mix be placed and finished as quickly as possible to prevent overvibration and overworking of the concrete which can lead to early deterioration of the patch. It is important to note that when using CaCl in patching, the mix must be discharged from the truck within 30 minutes after addition of the CaCl.

### PCC Placement

When placing patching material, there can often be extended delays between trucks resulting from factors such as traffic congestion, long hauls from the ready-mix plant to the project, or failure to order an adequate quantity of concrete. When extended delays occur mid-way through placement of a patch, workability becomes a big concern as noted above. Delays of up to 45 minutes are allowed per Specification 2529.03, H. However, workability can still be a concern. There are several things that can be done to help reduce the effects of lost workability including spreading the concrete out in the bottom of the patch and placing fresh mix on top, removal of small quantities of material, and, if the delay is anticipated, slow discharge of concrete while waiting for the next ready mix truck. When using the slow discharge option, it is important to note that maximum water to cementitious ratio and discharge times still apply. Delays of greater than 45 minutes will result in placement of a DW joint or removal and replacement of the patch material. Due to time constraints, it is often impractical to remove the patching material and replace it in the same working day. It is acceptable to allow the contractor to place the remainder of the patch to allow the roadway to be opened to traffic within the allowable time limits. This should be done with the understanding that the patch must be replaced at the contractor's expense.

### Curing

Specification 2529.03, H requires placement of insulation blankets and fiber board as cure for full-depth patches. These materials serve two purposes; one is to help retain moisture in the concrete and the other is to help retain heat in the concrete. Retention of moisture and heat are both very important in producing long-lasting, durable patches.

The specification requires that patches be covered within 20 minutes after completion of finishing on any one patch. However, this assumes continuous placement is occurring. If a delay occurs during placement of a large patch, the portion of the patch that has been finished should be covered. It is important to note that the cure time for the patch does not begin until the patch is covered.

### Patch Thickness

The thickness of a pavement to be patched may vary from the thickness shown in the project plans. Specification 2529.05, A, 2 allows for adjustment of payment for a patch that varies from the plan thickness by more than ten percent based on the average thickness of the pavement at the patch location. To determine the average thickness of a patch, measurements should be made at each end of the patch in a manner that represents the thickness of the existing pavement at each end of the patch. Measurements from each end of the patch should then be averaged to determine an average thickness for the patch. Adjustments should be made for patches that are thinner or thicker than the plan thickness.

Typically Worksheet *E003* is used for documenting patch locations and sizes. Because adjustments are now made to the pay quantity for a patch based upon variance in the pavement thickness from that shown in the plan, this form has been modified to automatically make adjustments to the pay quantity for a patch. Both Worksheet *E003* and *E003 Modified (FD Patches)* can be found at the following locations:

DOTNET http://dotnet/construct/construction_forms.htm
WEB http://www.iowadot.gov/construction/contract_admin.html

When inspecting a patching project, an inspector may find it easier to document individual patch locations electronically on Worksheet *E003 Modified (FD Patches)*. This worksheet will automatically calculate adjusted pay quantities for overdepth or underdepth patches. The total quantity for the day or week can then be transferred from this worksheet to Worksheet *E003* in Fieldmanager in a single line entry. *Appendix 9-8* shows an example of automatically adjusted pay quantities on Worksheet *E003 Modified (FD Patches)*.

### Saw Cuts

Some contractors have delayed saw cuts for C, CD, and RT joints in full depth PCC patches until after the minimum 5-hour cure period (on two-lane roadways and roadways requiring shortened cure time). Due to rapid setting concrete used for these patches, random cracks often appear when joints are not sawn quickly enough. Any C, CD, or RT joints in full-depth patches shall be sawn as soon as possible as long as raveling of saw cut edges does not happen. This early sawing will require temporary removal and replacement of required curing materials.

Any random cracks that appear due to delay of saw cut operation shall be repaired by the Contractor. Methods of repair are to be submitted to the Engineer for approval. Recommended methods of repair for random or uncontrolled cracks are included in Appendix 9-6. These repairs will be at the expense of the Contractor if due to lack of timely sawing.

## 9.72 PARTIAL-DEPTH PCC PATCHES

In addition to the difference in sealing requirements, another difference between partial-depth repair and partial-depth finish patches is the requirement that the edges of partial-depth finish patches be sawed as noted in Specification 2530.03, B, 3. This is required to provide a clean interface between the patch and the existing pavement to reduce the chances of spalling since the finish patches are intended to be the final driving surface. Because partial-depth repair patches are used on pavements that are to be resurfaced, spalling is not a concern and rougher patch edges can be allowed.

### Materials

As with full-depth PCC patches, partial-depth PCC patches are usually placed using an M mix with CaCl. This is identified as Class B Patching Material in Specification 2530.02 However, Class A and Class C Patching Materials are also allowed. Class A Patching Materials are early set, high early strength mixes that must meet the requirements of *Materials I.M. 491.20*. Appendix A of the I.M. lists approved brands of Class A patching material. Requirements of Class C Patching Materials include a minimum of 36 hours of cure and the use of an M mix without CaCl.