Rubblization: A Cost-Effective Option

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The first reported use of rubblization and asphalt pavement overlay occurred in 1986 on a New York State Department of Transportation (DOT) project. Since then 7,000 lane-miles of concrete pavement have been rubblized in the United States. Many state, county and local agencies regularly specify this solution for concrete pavements at the end of their service lives. For example, the Wisconsin DOT has let an average of 100 lane-miles per year over the past five years. Another 160 lane-miles was rubblized on county and local projects in Wisconsin during the same time period. Antigo Construction, Inc. (Antigo) has completed rubblization projects in 30 states, three Canadian provinces and five other countries.

Why is rubblization and asphalt pavement overlay so popular in so many places? All types and thicknesses of concrete pavement can be rubblized. The process is very cost effective especially when compared to full-depth reconstruction. Construction can proceed quickly while minimizing the impact on through traffic. Excellent long-term pavement performance is being achieved. Because all of the existing pavement structure is reused without having to remove and haul it off-site, the rubblization and asphalt pavement overlay process is also environmentally friendly.

Figure 1. Rubblizing Ramsey CSAH 88.

Jointed plain concrete pavement (JPCP), jointed reinforced concrete pavement (JRCP) and continuously reinforced concrete pavement (CRCP) are all good candidates for rubblization. While crack/break and seat has been widely used on JPCP and JRCP to reduce slab action in order to delay the onset and reduce the severity of reflection cracking in an asphalt pavement overlay, rubblization has the advantage that it eliminates slab action and greatly reduces the resultant reflection cracking, and is also effective for CRCP. Antigo has successfully rubblized 37 CRCP projects totaling over 450 lane-miles.

As agency needs have increased dramatically without available revenues keeping pace, cost effectiveness has become an increasingly important consideration. The rubblization and asphalt pavement overlay process requires significantly less raw materials than full-depth reconstruction and is much less likely to require expensive subgrade correction. Rubblization and asphalt pavement overlay can proceed very quickly, thus reducing project cost and motorist inconvenience. Traffic can be maintained in an adjacent lane eliminating the cost and inconvenience of detours and crossovers. Production rates of over 5 lane-miles per day have been achieved when accelerated construction schedules have been required.

The success of a rubblization project is best measured by the long-term pavement performance of the asphalt pavement overlay. Several recent studies have found that excellent performance is being achieved. In-depth studies have analyzed pavement performance in Illinois, Michigan, and Wisconsin and have found that pavement performance is meeting or exceeding initial design assumptions and expectations.

Several Minnesota agencies have used rubblization and asphalt pavement overlay as a rehabilitation technique since 1999 with great success. These projects are providing a great level of service to the public and include:

- TH 53 south of Eveleth
- Superior Street in Duluth
- Freeborn County State Aid Highway 45 (CSAH 45)
- Harrison Street in Shakopee
- TH 169 from Chisholm to Virginia
- Otter Tail CSAH 88
- Winona CSAH 32
- Faribault CSAH 16
- TH 5 near Oakdale
- Rock CSAH 4
- Ramsey CSAH 88

Sue Miller, Freeborn County Engineer, said ***"The highway [CSAH 45] is performing as expected and we are very pleased with the results."***

Figure 2. Ramsey CSAH 88 Completed.

The construction industry has been a leader in recycling for many years. Recently, the general public has become much more aware of environmental impacts and sustainability concepts and all levels of government are responding with new requirements for transportation planning, project design and construction activities. The rubblization and overlay process has been achieving these goals for years. The process will become even more attractive as the emphasis on environmental stewardship and sustainability increases. As agencies consider the rubblization and overlay option they can be informed by the experience of other agencies. There are common questions and concerns that are often raised when first considering this process.

- **What is the proper asphalt pavement overlay design over a rubblized concrete pavement?** Asphalt pavement overlay thickness design can be determined easily with DOT standards and publications that are available. The basic variables that need to be established are subgrade support (subgrade and sublayers), existing pcc type and thickness, and design traffic.
- **What level of subgrade support is required?** Subgrade support should be evaluated to determine if it is adequate for rubblization and overlay. Marginal subgrade can be accommodated by increasing the rubblized particle sizing somewhat to increase the structural support of the rubblized concrete layer.
- **Can urban pavements with underground utilities and curb and gutter be rubblized?** Many such pavements have been successfully rubblized. The rubblizing energy is modified as necessary to avoid damage to underlying utilities. Surface milling of the concrete to create a wedge at the gutter that can be filled with asphalt pavement is often used to minimize the depth of asphalt pavement in the gutter.
- **How are overhead structures with minimum clearance issues handled?** There are several options available when clearance requirements do not allow for the required asphalt pavement thickness over rubblized concrete. One is to reconstruct the area under the structure to a desired elevation. Other options are a thinner overlay with or without cracking and seating the existing concrete pavement. Another option is partial-depth concrete milling and asphalt pavement inlay. On some projects it may be cost effective to jack the bridges to allow for rubblization and place the design thickness of the overlay for the entire length of the project to provide the best long-term pavement performance.

The 2003 MAPA publication of Best Management Practices and Specifications of Rubblization has been updated and is located on MAPA's web site at www.asphaltisbest.com under "Resources." Contact MAPA at info@mnapa.org, 651-636-4666, or visit our web site to view the contact information for MAPA members who are available to discuss potential rubblization and overlay projects.