



16th Avenue S.W. PCC Widening and Unbonded Concrete Overlay/Inlay Project

Project Report #13

Cedar Rapids, Iowa

August, 1993

In 1912, Carl Fisher conceived the idea of a transcontinental highway from the Atlantic to the Pacific Ocean, hard surfaced and marked throughout its length. Because crushed stone or gravel was the common surfacing material, he called it "the Coast to Coast Rock Highway." At a later date in order to promote more public support, the title was changed to "The Lincoln Highway." As public endorsement for such a route gained favor and attracted cash contributions, the cement industry agreed to furnish its product for construction on the same basis as contributions from the motor car manufacturers. In Iowa the road totaled 358 miles, between Clinton and Council Bluffs, and was located on various city streets in Cedar Rapids, including Mt. Vernon Road and Johnson Avenue, subsequently being designated US 30.

During 1926 on 16th Avenue S.W. the initial portland cement concrete paving (PCC) was constructed 7 inches thick and 20 feet wide from near Wiley Blvd. to west of West Post Road, a distance of about 0.75 miles, where it intersected the Lincoln Highway. The road was widened in 1960 to 24 feet and overlaid with 3 inches of asphalt mix, followed in 1977 by an additional 1 inch ACC resurfacing and by Cutler reprocessing in 1989.

Throughout its 67 years of arterial service, commercial and residential developments spread westerly as Cedar Rapids grew in population from 56,097 (1930) to 110,243 (1980). When urban area motor vehicle traffic expanded to volumes which could not operate effectively or safely on municipal streets, relocated highway US 30 was shifted south to bypass congested areas and increase road user benefits. After being opened to traffic, agreement was reached with the City of Cedar Rapids for payment of compensation to place the old road in a "good state of repair" and jurisdiction passed from the Iowa Department of Transportation on June 3, 1986.

As modernization of adjoining segments were completed from I-380 westerly, attention was directed by the city to this last major project located on 16th Avenue SW.



Following their July 15, 1992 letting, Cedar Rapids awarded a municipal contract to Horsfield Construction Company (ICPA Member) of Epworth, Iowa to grade and re-pave the existing 2-lane roadway by widening to 5 lanes. This design will accommodate current (1991) traffic of 9500 AADT, expanded to 12,537 in 25 years. The plan called for providing a 69 foot b-b cross-section consisting of 2.5 foot wide exterior curb and gutter units, 4-12 ft. driving lanes and a 16 ft. storage lane for left turning vehicles in the center. The 9 inches thick PCC widening units were positioned with two lanes on the south side and a single lane on the north side of the AC surfaced middle lanes. All lanes were to receive an asphalt overlay. Staging requirements needed to meet traffic service maintenance demands significantly contributed to the \$1,589,890.77 contract cost.

During the 1992-93 winter shutdown, Horsfield asked the Cedar Rapids Engineering Department to consider an unbonded PCC overlay over the existing 2-lane roadway in lieu of the asphaltic overlay shown on the original project plans. The Project Engineer obtained available information on traffic counts and vehicle types, including trucks. These counts were projected ahead for a 25 year service life. Using the computer design program of the Iowa Concrete Paving Association for overlay design, an 8-inch PCC thickness requirement was established. The Engineering Department and the contractor then jointly determined necessary grade changes, developed a revised staging concept and evaluated associated costs for such substitution.

To accommodate the new PCC surface, outside gutter line elevations were raised 3 inches, and roadway cross slopes were increased slightly. The existing ACC surface was milled to a depth of 3 inches, leaving 1-inch of old ACC to serve as a bondbreaker.



The principal benefit resulting from the revised design is increased service life of the roadway before major rehabilitation work would be required. In Cedar Rapids, past experience indicates that rutting of the asphaltic surface originally proposed would be expected within 10 to 15 years because of heavy truck traffic. Accordingly, within the expected 25-year service life of the unbonded PCC overlay, an asphalt surface would have to be removed by milling at least once. A second full replacement would likely be required at the end of the 25-year service life. Based on estimated quantities and the associated unit prices in this contract, removal and replacement of the asphaltic surface one time would cost approximately \$135,000.

In addition, the reflective cracks in the asphaltic surface would have to be routed and sealed to prevent damage

to the surface due to water penetration, salt induced deterioration, freeze-thaw and related problems. PCC roadways also require periodic attention for optimal service life. However, asphaltic surfaces tend to show reflective cracking due to the different behaviors of the surface and the underlying PCC roadway. It would be expected that, over a 25-year service life, the asphaltic surface would require routing and sealing of cracks at least twice. Over the same service life, a PCC roadway would require similar work perhaps once. A routing and sealing program on 16th Avenue within the noted project limits, for either type of roadway surface, would cost approximately \$50,000 at today's prices.

Referring to project files for documented details:

- Total additional costs related to substituting a PCC overlay for the AC resurfacing: \$153,896.20
- Total quantity and unit price reductions to original contract items: - 101,304.14
- Net estimated increase to project costs: \$ 52,592.06

On May 5, 1993 the City Council approved Resolution No. 701-5-93 authorizing Extra Work Order No. 110 as being in the best public interest.

All mainline concrete was placed with Horsfield's two track GOMACO 2500 paver. For the outer lanes, guidance was provided by stringline staked at 25 foot intervals. For the final interior lane pour, sensors on both sides were locked to grade using skids that traveled on previous pours.

Keyways and epoxy coated bars were used to tie pavement units together and to assure load transfer. The IDOT's C3WRC paving mix was supplied by Hawkeye Ready Mix, Inc. from their Cedar Rapids plant on Wilson Ave. SW. An astroturf drag texture was obtained and contraction joints for hot pour filler were achieved by using the new Soff-Cut G-2000 saw.

Completion of this project will greatly enhance the performance and attractiveness of this gateway route to serve its intended function in the city of Cedar Rapids.

Additional details may be obtained by contacting:
Iowa Concrete Paving Association
(515) 278-0606