DO IT RIGHT THE SECOND TIME

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It is easier and safer, especially for those of us in the public sector, to continue to "do things like we always have." Sometimes this is a defense mechanism. We know that the old way is not the best or most efficient way to complete a project or we know that better technology exists. If it works, nobody notices, and if it fails we have a built in excuse and cushion: "we've always done it that way."

In Henderson, Kentucky, we have made a commitment to pursue a program of reconstructing City streets with un-bonded concrete overlays, to provide a long term solution to deterioration. Three whitetopping projects been completed and two more projects will be completed over the next two years. These projects are expected to last forty years or more.

Each project began with milling off the asphalt and the original concrete curb section. This was followed by the repair of the old concrete pavement which would serve as the base for the overlay. With the exception of a few joint failures, the primary problem with the old concrete was caused by utility excavations which were never properly repaired. These old utility excavations, as well as any other failed areas, were removed and replaced with stone base and new concrete.

Concrete Pavers of Evansville, Indiana, has been the low bidder on each of the projects. However, our paving contract for the 1991 project was $14,000 less than the bid for the 1990 project, even though the 1991 project included approximately ten per-cent more area and the type of work was identical. For each of the three projects, we have had a different concrete supplier. On the 1991 project, the supplier, Henderson Ready Mix, Inc., changed ownership less than one week before the paving began.

Bid specifications for each project required a concrete mix with a minimum compressive strength of 4,000 PSI and a minimum flexural strength of 500 PSI after twenty-four hours. We have had no problem reaching and exceeding these minimum strengths in any of the three projects. Twenty-four hour cylinder strengths for the 1991 project ranged as high 5,270 PSI with beams of the same age testing as high as 667 PSI. During the 1990 project we tested cylinders whose compressive strength exceeded the capacity of the testing equipment of 5,659 PSI after two days. Seven-day beam strengths routinely exceeded 1,000 PSI, with a maximum of 1,125 PSI.

Other components of the mix included a water reducer to achieve a workable mix and still maintain a good water cement ratio. The average slump for the project was one inch and the entrained air was five per-cent. Polypropylene fibers were added to the concrete mix to control plastic cracking. Other

benefits of the fibers include long term secondary reinforcement, and reduced permeability, as well as improved impact, abrasion, and shatter resistance. The increased support and cohesiveness of the mix allowed the slip-form paver to leave a well formed edge for both the slab and the curb back. No problems were experienced from the fibers while finishing the slab nor was there any "hairy" appearance.

Polyethylene sheeting was used as a bond breaker between the old and new pavements. The concrete mix was placed in front the slip-form paver directly on the polyethylene sheeting. The slip-form paver places a smooth well formed slab which requires a minimum amount of hand finish work. The paver is capable of placing a slab up to twenty-eight feet wide, plus curb and gutter on both sides, in a single pass. The additional cost for the curb and gutter placed in this manner is little more than the cost of the material alone, since it is a simple mechanical procedure to add the curb and gutter forms to the paver. However, the overall strength and durability of the pavement is improved dramatically. The integral curb and gutter adds the equivalent strength of an extra inch or more of concrete across the entire pavement section.

The mix design used for the 1991 project was as follows:

Type I Cement	740 Lbs,/C.Y.
Type C Fly ash	50 Lbs./C.Y.
Coarse Aggregate, No. 57 Stone, SSD	1,650 Lbs./C.Y.
Fine Aggregate, Sand, SSD	1,200 Lbs./C.Y.
Water	30 Gal./C.Y.
Micro-Air	0.75 Oz./C.Y.
Accelerator	16.00 Oz./C.Y.
Reinforcing Fiber, Mainline	1.50 Lbs./C.Y.
Reinforcing Fiber, Intersections	2.25 Lbs./C.Y.

Curing compound was applied to the finished surface to control the rate of cure. Intermittent grooved joints are placed to control cracking in the rapidly curing concrete mix until sufficient curing has taken place to allow sawing of all joints. As soon as curing allowed, joints were sawed at all locations where joints existed in the original pavement with subsequent joints sawed to provide a maximum longitudinal and transverse joint spacing of twelve (12) feet. Joints were sealed with a hot poured elastic joint sealer.

When these whitetopping projects are completed we have a completely new street. This is not undertaken in the same manner as a conventional overlay. All curb and gutter is replaced, all damaged sidewalks are repaired or replaced, all private driveways are adjusted, etc. so that the final product is not just a smoother street, but a new street. Property values on these streets have been improved substantially. In fact, the increase in property values along these streets approaches the cost of the project. The response from individual property owners has been very favorable.

An auxiliary benefit to this process is the improved efficiency of street lighting. This is beneficial, not just for esthetics, but because it makes the area safer both for motorists and for pedestrians. Overall lighting can actually be reduced when concrete pavement replaces asphalt.

Listed below is various cost information relating to this project.

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CONSTRUCTION COST INFORMATION

Component	Total Cost	Cost/S.Y.
Milling	$ 4,700	$ 0.83
Base Repairs, Misc. Labor and Eqpmt. For Placing	20,000	3.78
Overlay, W/C&G Concrete, W/Fiber	44,000	8.30
	51,700	9.76
TOTAL	$120,400	$22.67

Had we chosen the safe and easy asphalt overlay, the total cost would have been approximately $76,500 or $14.43/S.Y. including new curb and gutter and base repairs, and would have had a service life of twelve to fifteen years. A forty year service life from the asphalt overlay(s) would require a minimum additional capital expenditure of $50,000 over the forty year life of the project. This is assuming that there is no increase in the cost of the asphalt over the forty year period and that no periodic maintenance is required.

Obviously, the concrete overlay is the best solution for this specific project. This does not even take into account the savings in maintenance costs, or such added benefits as improved lighting and increased property values. Whitetopping is not the answer to all overlay projects, nor will it ever replace all asphalt overlays. However, when it is the appropriate choice, it is a long term, cost effective solution.