

Case Study

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CONVENTIONAL VS. COMPOSITE PAVING

Overview

- To compare the costs of Conventional Paving to those of Composite Paving.
- What is Composite Paving?
 - Paving process utilizing two separate lifts of pavement.
 - First lift thicker using recycled concrete in lieu of Class A aggregates.
 - Second thinner lift using standard Class A aggregates.
 - Also called wet on wet, meaning that the second lift is paved directly onto the first using a two paver train.
- Composite Paving is an attractive option when high quality Class A aggregates are not readily available.

Objective

- Find a project located in an area that has poor availability of Class A aggregates.
 - Take paving costs from project bid as Conventional Paving and compare to expected costs of Composite Paving.
- Under these circumstances is Composite Paving an economical alternative?

Case Study

◎ Project

- U.S. Highway 14 Concrete Paving

◎ Location

- Near Waseca, MN

◎ General Stats

- 90,000 Cubic Yards of Concrete
 - 80,000 CY Mainline, 310,000 SY
 - 10,000 CY Crossroads and Ramps
- 19.5 Miles paving
- 22 total days paving scheduled
- Closest Class A aggregate source was New Ulm Quartzite (2 hour round haul)

Comparison

⦿ Conventional

- 1 Boom Truck
- 1 Paver
- 1 Belt Placer
- 1 Cure/Texture
- 1 Skidsteer
- 1 Pickup
- 1 Service Truck
- 1 Water Truck
- 13 Crew Members

⦿ Composite

- 1 Boom Truck
- 2 Pavers
- 2 Belt Placers
- 2 Cure/Texture
- 1 Skidsteer
- 1 Pickup
- 1 Service Truck
- 1 Water Truck
- 1 Steel Bristle Broom
- 18 Crew Members

Comparison

⦿ Conventional

- Assumed Mainline paving production of .90 miles/day
- Unit Cost to pave/tie/green saw of \$2.98/ SqYd or a total of \$923,800.00.
- Mobilize and operate one plant
- Plant operations cost of \$1.60/ CY to batch mix
 - Cost includes plant operator, loader and operator

⦿ Composite

- Assumed identical production of .90 miles/day
- Unit Cost to pave/tie/saw of \$3.70/ SqYd or a total of \$1,147,000.
- Mobilize and Operate 2 Plants
 - Marginal cost to mobilize second plant of \$50,000 or a \$.55/CY premium
- Operations cost running two plants of \$3.82/ CY to batch mix
 - Cost includes 2 plant operators, loader and operator



Conventional

One Paver

One Placer

Cure/Texture Machine

13 Crew Members

This illustrates a typical
Conventional paving operation



Batch Plant

Two Batch Plants would be necessary to batch the different mix designs simultaneously

COMPOSITE PAVING



2 Pavers

2 Belt Placers

2 Cure/Texture Machines

18 Crew members

COMPOSITE PAVING



- The lower lift comprised of recycled concrete as the source of coarse aggregate.



- The upper lift using the high quality, Class A aggregates.

Conventional vs. Composite

Pave, Tie, Green Saw	
Sq. Yds.	310,000
\$ per Sq. Yd.	\$2.98
Total Cost	\$923,800.00
Structural Concrete	
Cubic Yards	80,000
\$ per CY	\$71.54
Total Cost	\$5,723,200.00
Conventional Cost	\$6,647,000.00

Pave, Tie, Green Saw	
Sq. Yds.	310,000
\$ per Sq. Yd.	\$3.70
Total Cost	\$1,147,000.00
Structural Concrete	
Cubic Yards	80,000
\$ per CY	\$69.31
Total Cost	\$5,544,800.00
Composite Cost	\$6,691,800.00

Findings

- Conventional was cheaper by \$44,800, a little less than a 1% difference.
 - The increased cost of operating two paving crews gave the Conventional Method a \$.72/SY advantage in paving.
 - The increased cost of operating two plants gave Conventional a \$2.22/CY advantage in plant operation cost.
 - However, the increased savings in using recycle over Class A was \$4.45/CY

Findings

- The lower level is able to use recycle in place of Class A for all of the coarse aggregates in the lower lift.
 - This reduces the total amount of Class A aggregates needed for the job by 2/3.
- Originally Class A material was on a 2 hour round haul, crushing pavement on site reduces the truck time to a 20 minute round

Aggregates

Conventional Aggregates	
Type	Tons
3/4" Class A	34,270
1 1/2" Class A	37,213
Total Tons	71,483
Class A	
Material \$/Ton	\$12.78
Trucking (2 Hour)	\$7.46
Total \$ Per Ton	\$20.24

Composite Aggregates	
Type	Tons
3/4" Class A	11,310
1 1/2" Class A	12,280
Recycled Agg.	47,893
Total Tons	71,483
Recycled	
Material \$/Ton	\$7.00
Trucking (2 Hour)	\$1.45
Total \$ Per Ton	\$8.45

Aggregate Savings

- The total tons of coarse aggregates used for the job remains the same.
 - Class A aggregates are only necessary in the upper lift, meaning only 1/3 the original amount of Class A aggregates are needed.
- Recycle can be produced on site
 - Reduces the trucking from 2 hour round to 20 minutes.
From \$7.46 to \$1.45 per ton.
- The material price of recycle is between \$5 and \$6 per ton less than Class A.

Variables

- ⦿ This project was a worse case scenario, with aggregate sources an hour away.
- ⦿ Costs were not all inclusive, the price for retardant and accelerator would have to be factored in.

Conclusion

- Implementation of a Composite Paving process would be a viable and competitive alternative to Conventional Paving, if:
 - Class A aggregates aren't readily available
 - Long haul times drive the price of the aggregate too high
 - Recycled Concrete could be produced on or near the site
 - Haul times would have to be cut to minimal levels
 - Would have to produce Recycle at about 50% the cost of Class A
 - You were capable of producing and paving at an equal rate to conventional paving