Experimental Features in Highway Construction Final Report

Polyester Concrete for Approach Slabs

For Inclusion in the

Parks Highway MP 239-252 Rehabilitation Project

IM-0A4-4(15)/61275

Alaska Department of Transportation & Public Facilities

Statewide Bridge Design Section

Prepared by

Leslie Daugherty, PE, SE

Senior Bridge Engineer

January 2018

Table of Contents

Executive Summary 3

Description of Experimental Feature 4

Post-Construction Monitoring 4

Cost Comparison 5

Field Installation Time 5

Recommendations and Conclusions 6

Appendices

Appendix A ..... July 2017 Photographs

Appendix B ..... Compilation of Bids

Appendix C ..... Current Polyester Concrete Special Provision

Executive Summary

This experimental feature project sought to test the effectiveness of polyester concrete used in bridge approach slabs. Polyester concrete has been used as a thin bridge deck wearing surface for several decades in other states. The first bridge to receive a polyester concrete overlay in Alaska was the Susitna River Bridge #254 in 2008. This experimental feature project evaluated the structural performance and construction benefits of polyester concrete used in a different application than thin overlays.

The Contractor awarded the Parks Highway MP 239-252 Rehabilitation Project was QAP and their Subcontractor for the bridge work, including the approach slabs, was Hamilton Construction Company. The polyester concrete supplier was Kwik Bond Polymers.

The approach slabs were placed at the Antler Creek Bridge (Bridge Number 1141) on June 21, 2014 and June 28, 2014. Subsequent post-construction monitoring took place in 2015, 2016, and 2017. This report details the findings and conclusions from the installation and monitoring of this experimental feature project.

Overall, this project provided a better understanding of the costs and potential applications of polyester concrete. Large applications of polyester concrete such as approach slabs appear to be structurally feasible, but may not be ideal due to cost and placement obstacles.

Description of Experimental Feature

This experimental feature project evaluated the effectiveness of polyester concrete for approach slabs at the Antler Creek (Bridge Number 1141) on the Parks Highway south of Healy. The original bridge selected for the experimental feature was Dry Creek (Bridge Number 851) on the Parks Highway in Healy. Both bridges were part of the project, so the project contractor requested this substitution to accommodate scheduling preferences. The approach slabs designed for the Dry Creek Bridge were 20 feet long, 30 feet wide, 1 foot thick and not skewed. The approach slabs installed at Antler Creek had the same dimensions, but also a 30-degree skew. The reinforcing steel sizes and spacing were the same for both the Class A and polyester concrete approach slabs on the project. All approach slabs on the project used epoxy-coated reinforcing steel.

Polyester concrete use is typically limited to thin bridge deck overlays. Alaska installed its first polyester concrete overlay in 2008, and states like Washington, Nevada, and California with much higher traffic volumes than Alaska have successfully used polyester concrete overlays for decades. There are several companies that produce polyester concrete, so sole sourcing the product was not necessary.

Polyester concrete is composed of a polyester resin binder and select aggregate material. The concrete is rapid-setting, high-strength, and impermeable. Traffic can be allowed to drive on the polyester concrete within 4 hours and compressive strength after a 24-hour period can reach 10,000 psi. The impermeable characteristics provide protection from chlorides and other contaminants to help protect the steel reinforcement. Polyester concrete was evaluated due to these properties, which offered the potential for reduced traffic control times and cost compared to conventional concrete that must be cured for 7 days according to DOT&PF specifications.

Conditions needed for placing polyester concrete include ambient temperatures at a minimum of 50° F and rising with completely dry ground and materials. The concrete must be placed within 15 minutes after the catalyst is introduced. As the resin begins to rise to the surface during curing, approved sand is broadcast over the surface to provide a non-skid surface and tining is added for additional traction.

Post-Construction Monitoring

The experimental feature workplan for this project required monitoring of the slabs for three years. A summary of the inspections and findings is listed below. Further information is available in the interim reports from these inspections.

2014: The approach slabs were placed and inspected by construction staff on June 21 and 28, 2014. Daily reports indicate that rain caused areas of uncured polyester concrete that had to be corrected in the southbound approach slab at the north side of the bridge.

2015: The approach slabs were inspected on August 11, 2015. No significant deficiencies were noted except the surface was covered with areas of thin asphalt from the adjacent paving.

2016: In addition to a routine safety inspection of the bridge and approach slabs on July 20, 2016, a separate monitoring inspection of the approach slabs was completed on September 9, 2016. The approach slabs were again visually assessed for cracks, creep, rutting, damage to the surface and any other deterioration. Wear with exposed aggregate was present in the approach slabs on both ends of the bridge. Wear seemed to have increased since the 2015 inspection.

2017: The approach slabs were inspected on July 16, 2017. Minor deficiencies were noted at both approaches with wear typical in the wheelpaths. The deficiencies seemed to be concentrated in areas that had problems during placement. The deck had some moisture at the time of the inspection, but chain dragging did not reveal any delaminations.

Cost Comparison

The cost of polyester concrete was significantly higher than conventional portland cement concrete. The lump sum bid prices for the polyester concrete for the lowest three bidders were $500,000, $260,000, and $300,000. The table below shows the cost per cubic yard (CY) of Item 525(1) Polyester Concrete and conventional Item 501(1) Class A Concrete using the bid prices from the project. These calculations are based on 46.5 CY for the approach slabs and 803.4 CY of Class A Concrete, so direct comparison may not be valid due to “economies of scale”.

Bidder	Polyester Concrete Price (Lump Sum)	Polyester Concrete Price ($/CY)	Class A Concrete Bid Price ($/CY)	Price for Approach Slabs Using Class A Concrete Bid Price (Lump Sum)
Lowest Bidder	$500,000	$10,752.69	$1,244.71	$57,879
Second Bidder	$260,000	$5,591.40	$1,593.23	$74,085
Third Bidder	$300,000	$6,451.61	$1,742.59	$81,030

Field Installation Time

The placement of the polyester concrete was somewhat slower than conventional portland cement concrete because the contractor elected to use mortar mixers instead of truck mixers. Otherwise, polyester concrete can be placed with a special truck for mixing, and none of those trucks are located in Alaska. The polyester concrete was also placed in two lifts, a bottom lift 10 inches thick and a top lift of 2 inches, whereas conventional concrete would be placed in one lift. The two lifts were not required by the contract, but proposed by the contractor. There was also a rain delay when placing the slabs on the first installation day that makes exact time comparison difficult. However, the curing time of polyester concrete was considerably quicker

than conventional concrete. The manufacturer typically considers the polyester concrete sufficient for traffic after a rebound hammer test according to ASTM C805 shows a rebound number of 24, or approximately 2,500 psi, read from the "A" scale. Due to other construction factors, the approach slabs were not opened on the day of placement.

Recommendations and Conclusions

After three years of monitoring, it is not clear that polyester concrete will perform more favorably than conventional Class A concrete, and the high initial cost of polyester concrete may not outweigh the time savings of placement and traffic control. Further feedback from construction staff suggested that the fumes and tight time constraints during placement make polyester concrete use less desirable. Placement of this product is not possible in the rain and during any wet conditions, whereas conventional concrete is less susceptible to problems from moisture during placement.

Perhaps other practical applications for polyester concrete are smaller components of the bridge under the bridge deck. Items like diaphragms and shear keys would be protected from rain, would not be susceptible to wear, and would still benefit from fast curing times. Polyester concrete may also be practical in areas highly susceptible to corrosion because polyester concrete is impermeable to moisture once cured. For that reason, uncoated reinforcing steel can be used with polyester concrete, saving the extra cost and handling steps of epoxy-coated reinforcing steel. Further investigation of design parameters tied to LRFD equations, such as strength, modulus of rupture, resistance factors, etc. would be needed to ensure that the polyester concrete design is appropriate for these applications.

The special provisions for polyester concrete have been updated based on lessons learned from this experimental feature and subsequent overlay projects to reflect lessons learned by the Department. For reference, a current version of the special provisions is in Appendix C of this report and can be compared with the originally proposed special provision located in Appendix E of the *Experimental Features in Highway Construction Workplan* from June 2013. Development of the special provision is ongoing so the attached sample should not be used for construction.

The high cost of polyester concrete is also a deterrent for large applications. However, this project did not include optimizing polyester concrete strength by designing a shallower approach slab than that needed for conventional concrete. Another factor that could be explored to reduce cost is use of local aggregates, because the supplier for this project shipped the aggregate from out of state. Yet another potential approach to reducing costs is planning enough projects in relative close proximity during a construction season to justify bringing a specialized mixing truck to Alaska.

In conclusion, this project successfully provided a better understanding of the costs and applications of polyester concrete. Polyester concrete has a proven track record for thin bridge deck overlays and has potential for small bridge components. Large scale use of polyester

concrete approach slabs is not recommended at this time but would be practical if one or more of the following conditions apply:

- project time constraints do not allow 7 days for curing Class A concrete
- the cost of polyester concrete becomes competitive with portland cement concrete
- design parameters are developed that allow reduction in the amount of polyester concrete needed from 1-foot thick approach slabs

APPENDIX A

July 2017 Photographs

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **1**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **2**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **3**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **4**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **5**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **6**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **7**
NE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **8**
FE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **9**
FE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **10**
FE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **11**
FE Approach Slab

Bridge No. **1141** Br. Name **Antler Creek** Date **07/16/17**
Inspector **Murray / Knapp** Frame **12**
FE Approach Slab

Bridge No.	**1141**	Br. Name	**Antler Creek**	Date	**07/16/17**
Inspector		**Murray / Knapp**		Frame	**13**
FE Approach Slab					

Bridge No.	**1141**	Br. Name	**Antler Creek**	Date	**07/16/17**
Inspector		**Murray / Knapp**		Frame	**14**

Bridge No.	**1141**	Br. Name	**Antler Creek**	Date	**07/16/17**
Inspector		**Murray / Knapp**		Frame	**15**

Bridge No.	**1141**	Br. Name	**Antler Creek**	Date	**07/16/17**
Inspector		**Murray / Knapp**		Frame	**16**

APPENDIX B

Compilation of Bids

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No: IM-0A4-4(15)
AKSAS No: 61275
Project Name: Parks Highway M P 239-252 Rehabilitation
Project Location: Mp 239-252

Opened at: Fairbanks, AK
Date: Wednesday, November 27, 2013
By: Barbara L. Tanner, P.E.

Certified True and Correct: Barbara Tanner 12/2/2013, Chief of Contracts & LPA Design
Barbara L. Tanner, P.E. DATE

Compiled By: drb Checked By: jp

Order of Bidders Based on: Basic Bid

DBE Goal: 2.1%	State of Alaska DOT & PF Design Section Northern Region	QAP 240 W. 68TH AVE. ANCHORAGE, AK 99518 Phone:907-522-2211 Fax:907-344-7723	GREAT NORTHWEST, INC. PO BOX 74646 FAIRBANKS, AK 99707 Phone:907-452-5617 Fax:907-456-7779	GRANITE CONSTRUCTIO COMPANY 11471 LANG STREET ANCHORAGE, AK 99515 Phone:907-344-2593 Fax:907-344-1562

Basic Bid	ENGINEER'S ESTIMATE		LOW BIDDER		BIDDER 2		BIDDER 3	
Item No. *Description* *Quantity* *Pay Unit*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*
201(1A) Clearing								
1 Acre	3,000.00	3,000.00	10,000.00	10,000.00	4,000.00	4,000.00	10,000.00	10,000.00
201(3A) Clearing And Grubbing								
35 Acre	5,000.00	175,000.00	12,000.00	420,000.00	6,000.00	210,000.00	10,000.00	350,000.00
202(1) Removal Of Structures And Obstructions								
All Required Lump Sum	L.S.	30,000.00	L.S.	400,000.00	L.S.	705,664.00	L.S.	300,000.00
202(2) Removal Of Pavement								
380.3 Square Yard	10.00	3,803.00	50.00	19,015.00	20.00	7,606.00	50.00	19,015.00
202(17) Removal Of Culvert Pipe								
59 Each	800.00	47,200.00	1,000.00	59,000.00	10,000.00	590,000.00	1,000.00	59,000.00
202(114) Removal of Pavement								
18,454 Cubic Yard	10.00	184,540.00	10.00	184,540.00	17.00	313,718.00	5.00	92,270.00
202(118) Removal Of Temporary Works								
All Required Contingent Sum	C.S.	200,000.00	C.S.	200,000.00	C.S.	200,000.00	C.S.	200,000.00
203(3) Unclassified Excavation								
225,624 Cubic Yard	5.00	1,128,120.00	5.00	1,128,120.00	8.00	1,804,992.00	0.01	2,256.24
203(6) Borrow								
295,513 Ton	7.00	2,068,591.00	8.00	2,364,104.00	6.00	1,773,078.00	0.01	2,955.13
301(1) Aggregate Base Course, Grading D-1								
20,361 Ton	15.00	305,415.00	20.00	407,220.00	10.00	203,610.00	10.00	203,610.00
303(2) Reconditioning								
3 Mile	1,500.00	4,500.00	30,000.00	90,000.00	9,000.00	27,000.00	15,000.00	45,000.00
306(1) Asphalt Treated Base								
59,712 Ton	35.00	2,089,920.00	45.00	2,687,040.00	53.00	3,164,736.00	90.00	5,374,080.00
306(2) Asphalt Cement, Grade 52-28								
2,687 Ton	750.00	2,015,250.00	735.00	1,974,945.00	400.00	1,074,800.00	1.00	2,687.00
308(3) Crushed Asphalt Base Course								
All Required Lump Sum	L.S.	600,000.00	L.S.	700,000.00	L.S.	500,000.00	L.S.	1,570,000.00
401(1) Asphalt Concrete, Type II; Class B								
50,152 Ton	40.00	2,006,080.00	50.00	2,507,600.00	39.00	1,955,928.00	130.00	6,519,760.00
401(2) Asphalt Cement, Grade 52-28								
2,759 Ton	750.00	2,069,250.00	735.00	2,027,865.00	750.00	2,069,250.00	1.00	2,759.00
401(6) Asphalt Price Adjustment								
All Required Contingent Sum	C.S.	490,631.00	C.S.	490,631.00	C.S.	490,631.00	C.S.	490,631.00

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No: IM-0A4-4(15)
AKSAS No: 61275
Project Name: Parks Highway M P 239-252 Rehabilitation
Project Location: Mp 239-252

Opened at: Fairbanks, AK
Date: Wednesday, November 27, 2013
By: Barbara L. Tanner, P.E.

DBE Goal: 2.1%		State of Alaska		QAP		GREAT NORTHWEST, INC.		GRANITE CONSTRUCTIO COMPANY	
Basic Bid		ENGINEER'S ESTIMATE		LOW BIDDER		BIDDER 2		BIDDER 3	
Item No.	*Description*								
Quantity	*Pay Unit*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*
401(10)	Asphalt Material Price Adjustment								
All Required	Contingent Sum	C.S.	129,492.00	C.S.	129,492.00	C.S.	129,492.00	C.S.	129,492.00
402(1)	STE-1 Asphalt For Tack Coat								
67.6	Ton	800.00	54,080.00	900.00	60,840.00	800.00	54,080.00	750.00	50,700.00
406(10)	Rumble Strips								
22.5	Mile	1,000.00	22,500.00	2,500.00	56,250.00	1,500.00	33,750.00	1,500.00	33,750.00
501(1)	Class A Concrete								
All Required	Lump Sum	L.S.	1,687,140.00	L.S.	1,000,000.00	L.S.	1,280,000.00	L.S.	1,400,000.00
501(10)	Coring Concrete								
853	Linear Foot	150.00	127,950.00	25.00	21,325.00	62.00	52,886.00	65.00	55,445.00
501(11)	Grouting Bearings								
All Required	Lump Sum	L.S.	15,000.00	L.S.	15,000.00	L.S.	12,800.00	L.S.	15,000.00
502(1)	Post-Tensioning (Cast-in-Place Concrete)								
All Required	Lump Sum	L.S.	46,800.00	L.S.	312,000.00	L.S.	62,000.00	L.S.	65,000.00
503(1)	Reinforcing Steel								
All Required	Lump Sum	L.S.	120,335.00	L.S.	100,000.00	L.S.	154,000.00	L.S.	200,000.00
503(2)	Epoxy-Coated Reinforcing Steel								
All Required	Lump Sum	L.S.	414,375.00	L.S.	450,000.00	L.S.	280,000.00	L.S.	300,000.00
503(3)	Drill and Bond Dowels								
3,872	Each	80.00	309,760.00	50.00	193,600.00	43.00	166,496.00	45.00	174,240.00
504(1)	Structural Steel								
All Required	Lump Sum	L.S.	88,359.00	L.S.	150,000.00	L.S.	72,000.00	L.S.	100,000.00
504(3)	Bridge Joint Restrainer Units								
69	Each	2,500.00	172,500.00	1,000.00	69,000.00	2,800.00	193,200.00	3,000.00	207,000.00
504(4)	Pier Connection Screening								
8	Each	1,000.00	8,000.00	10,000.00	80,000.00	720.00	5,760.00	1,000.00	8,000.00
507(7)	Steel Bridge Railing Replacement								
3,370	Linear Foot	100.00	337,000.00	250.00	842,500.00	87.00	293,190.00	115.00	387,550.00
507(8)	Access Walkway Upgrades								
All Required	Lump Sum	L.S.	300,000.00	L.S.	50,000.00	L.S.	110,000.00	L.S.	100,000.00
513(1)	Field Painting of Steel Structures								
All Required	Lump Sum	L.S.	225,000.00	L.S.	1,000,000.00	L.S.	1,600,000.00	L.S.	1,600,000.00
514(2)	Graffiti Protection								
6,800	Square Foot	10.00	68,000.00	10.00	68,000.00	3.00	20,400.00	3.50	23,800.00
516(1)	Expansion Joint (Silicone)								
544	Linear Foot	100.00	54,400.00	25.00	13,600.00	155.00	84,320.00	165.00	89,760.00
516(4)	Bearing Replacement								
All Required	Lump Sum	L.S.	2,000,000.00	L.S.	25,000.00	L.S.	440,000.00	L.S.	500,000.00
518(1)	Bridge Deck Repairs								
500	Square Foot	500.00	250,000.00	50.00	25,000.00	102.00	51,000.00	110.00	55,000.00
518(2)	Bridge Deck Overlay								
26,730	Square Foot	30.00	801,900.00	20.00	534,600.00	15.00	400,950.00	16.00	427,680.00
525(1)	Polyester Concrete								
All Required	Lump Sum	L.S.	255,750.00	L.S.	500,000.00	L.S.	260,000.00	L.S.	300,000.00

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No: IM-0A4-4(15)
AKSAS No: 61275
Project Name: Parks Highway M P 239-252 Rehabilitation
Project Location: Mp 239-252

Opened at: Fairbanks, AK
Date: Wednesday, November 27, 2013
By: Barbara L. Tanner, P.E.

DBE Goal: 2.1%		State of Alaska		QAP		GREAT NORTHWEST, INC.		GRANITE CONSTRUCTIO COMPANY	
Basic Bid		ENGINEER'S ESTIMATE		LOW BIDDER		BIDDER 2		BIDDER 3	
Item No.	*Description*								
Quantity	*Pay Unit*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*
602(1)-72	72 Inch SPP, 10 Gage								
234	Linear Foot	450.00	105,300.00	800.00	187,200.00	800.00	187,200.00	2,000.00	468,000.00
602(108)	Composite Culvert Lining								
All Required	Lump Sum	L.S.	160,000.00	L.S.	50,000.00	L.S.	200,000.00	L.S.	200,000.00
603(1)-18	18 Inch CSP								
42	Linear Foot	90.00	3,780.00	150.00	6,300.00	140.00	5,880.00	500.00	21,000.00
603(1)-24	24 Inch CSP								
3,071	Linear Foot	100.00	307,100.00	130.00	399,230.00	150.00	460,650.00	200.00	614,200.00
603(1)-36	36 Inch CSP								
3,054	Linear Foot	125.00	381,750.00	160.00	488,640.00	250.00	763,500.00	250.00	763,500.00
603(1)-48	48 Inch CSP								
551	Linear Foot	200.00	110,200.00	210.00	115,710.00	350.00	192,850.00	300.00	165,300.00
603(3)-24	End Section for 24 Inch CSP								
1	Each	400.00	400.00	700.00	700.00	500.00	500.00	500.00	500.00
603(27)	Clean and Repair Pipe								
17	Each	800.00	13,600.00	3,000.00	51,000.00	700.00	11,900.00	1,000.00	17,000.00
604(100)	Inlet Grate								
2	Each	300.00	600.00	2,000.00	4,000.00	2,500.00	5,000.00	1,500.00	3,000.00
605(1)-18	18 " Perforated Corrugated Steel Pipe for Underdrain								
20	Linear Foot	140.00	2,800.00	150.00	3,000.00	1,000.00	20,000.00	150.00	3,000.00
605(4)	Blind Drain								
15	Linear Foot	80.00	1,200.00	2,000.00	30,000.00	200.00	3,000.00	100.00	1,500.00
605(5)	Porous Backfill Material								
867	Cubic Yard	30.00	26,010.00	70.00	60,690.00	40.00	34,680.00	50.00	43,350.00
606(1)	W-beam Guardrail								
22,498	Linear Foot	30.00	674,940.00	30.00	674,940.00	45.00	1,012,410.00	40.00	899,920.00
606(6)	Removing And Disposing Of Guardrail								
20,086	Linear Foot	3.00	60,258.00	5.00	100,430.00	4.00	80,344.00	5.00	100,430.00
606(9)	Controlled Release Terminal (CRT)								
4	Each	3,500.00	14,000.00	3,500.00	14,000.00	3,400.00	13,600.00	3,500.00	14,000.00
606(12)	Guardrail/bridge Rail Connection								
28	Each	2,500.00	70,000.00	4,000.00	112,000.00	2,200.00	61,600.00	2,250.00	63,000.00
606(13)	Parallel Guardrail Terminal								
43	Each	2,800.00	120,400.00	3,500.00	150,500.00	3,400.00	146,200.00	3,500.00	150,500.00
606(100)	Guardrail Mounted Wood Curb								
1,400	Linear Foot	6.00	8,400.00	10.00	14,000.00	6.00	8,400.00	10.00	14,000.00
606(108)	Crash Cushion								
1	Each	20,000.00	20,000.00	38,000.00	38,000.00	23,000.00	23,000.00	25,000.00	25,000.00
611(1A)	Riprap, Class I								
372	Cubic Yard	90.00	33,480.00	150.00	55,800.00	60.00	22,320.00	250.00	93,000.00
611(1B)	Riprap, Class II								
126	Cubic Yard	140.00	17,640.00	200.00	25,200.00	80.00	10,080.00	250.00	31,500.00

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No: IM-0A4-4(15)
AKSAS No: 61275
Project Name: Parks Highway M P 239-252 Rehabilitation
Project Location: Mp 239-252

Opened at: Fairbanks, AK
Date: Wednesday, November 27, 2013
By: Barbara L. Tanner, P.E.

DBE Goal: 2.1%		State of Alaska		QAP		GREAT NORTHWEST, INC.		GRANITE CONSTRUCTIO COMPANY	
Basic Bid		ENGINEER'S ESTIMATE		LOW BIDDER		BIDDER 2		BIDDER 3	
Item No. / *Quantity*	*Description* / *Pay Unit*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*
611(4)	Rock Outfall								
1	Each	4,000.00	4,000.00	2,000.00	2,000.00	15,000.00	15,000.00	5,000.00	5,000.00
613(2)	Culvert Marker Post								
172	Each	100.00	17,200.00	95.00	16,340.00	164.00	28,208.00	200.00	34,400.00
614(1)	Concrete Barrier, F Shape								
4,481	Linear Foot	80.00	358,480.00	110.00	492,910.00	82.00	367,442.00	100.00	448,100.00
615(1)	Standard Sign								
1,196.75	Square Foot	60.00	71,805.00	100.00	119,675.00	130.00	155,577.50	130.00	155,577.50
615(2)	Remove and Relocate Existing Sign								
15	Each	250.00	3,750.00	500.00	7,500.00	800.00	12,000.00	1,000.00	15,000.00
616(2)	1/2 Inch Diameter Thaw Pipe								
23	Each	1,300.00	29,900.00	2,000.00	46,000.00	1,600.00	36,800.00	5,000.00	115,000.00
618(2)	Seeding								
1,867	Pound	50.00	93,350.00	60.00	112,020.00	50.00	93,350.00	100.00	186,700.00
630(3A)	Geotextile, Reinforcement - Type I								
126,117	Square Yard	2.00	252,234.00	2.00	252,234.00	2.50	315,292.50	2.00	252,234.00
630(3B)	Geotextile, Reinforcement - Type II								
23,334	Square Yard	4.00	93,336.00	3.25	75,835.50	5.00	116,670.00	3.50	81,669.00
631(2)	Geotextile, Erosion Control, Class I								
3,732	Square Yard	4.00	14,928.00	3.50	13,062.00	2.50	9,330.00	1.50	5,598.00
635(10)	6" Insulation Board								
1,360	Square Foot	3.00	4,080.00	20.00	27,200.00	10.00	13,600.00	5.00	6,800.00
639(3A)	Approach - Residential								
20	Each	1,000.00	20,000.00	1,000.00	20,000.00	1,200.00	24,000.00	1,000.00	20,000.00
639(3B)	Approach - Commercial								
47	Each	1,500.00	70,500.00	1,100.00	51,700.00	2,000.00	94,000.00	1,500.00	70,500.00
639(3C)	Approach - Street								
12	Each	1,500.00	18,000.00	1,400.00	16,800.00	3,400.00	40,800.00	1,500.00	18,000.00
640(1)	Mobilization And Demobilization								
All Required	Lump Sum	L.S.	500,000.00	L.S.	1,000,000.00	L.S.	500,000.00	L.S.	500,000.00
640(4)	Worker Meals and Lodging, or Per Diem								
All Required	Lump Sum	L.S.	150,000.00	L.S.	350,000.00	L.S.	700,000.00	L.S.	100,000.00
641(1)	Erosion And Pollution Control Administration								
All Required	Lump Sum	L.S.	15,000.00	L.S.	10,000.00	L.S.	40,000.00	L.S.	1,000.00
641(3)	Temporary Erosion And Pollution Control								
All Required	Lump Sum	L.S.	150,000.00	L.S.	115,000.00	L.S.	100,000.00	L.S.	100,000.00
641(4)	Temporary Erosion And Pollution Control Additives								
All Required	Contingent Sum	C.S.	100,000.00	C.S.	100,000.00	C.S.	100,000.00	C.S.	100,000.00
641(6)	Withholding								
All Required	Contingent Sum	C.S.	0.00	C.S.	0.00	C.S.	0.00	C.S.	0.00
641(7)	SWPPP Manager								
All Required	Lump Sum	L.S.	20,000.00	L.S.	25,000.00	L.S.	40,000.00	L.S.	1,000.00
642(1)	Construction Surveying								
All Required	Lump Sum	L.S.	100,000.00	L.S.	175,000.00	L.S.	260,000.00	L.S.	200,000.00

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No: IM-0A4-4(15)
AKSAS No: 61275
Project Name: Parks Highway M P 239-252 Rehabilitation
Project Location: Mp 239-252

Opened at: Fairbanks, AK
Date: Wednesday, November 27, 2013
By: Barbara L. Tanner, P.E.

DBE Goal: 2.1%		State of Alaska		QAP		GREAT NORTHWEST, INC.		GRANITE CONSTRUCTIO COMPANY	
Basic Bid		ENGINEER'S ESTIMATE		LOW BIDDER		BIDDER 2		BIDDER 3	
Item No.	*Description*								
Quantity	*Pay Unit*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*	*Unit Price*	*Amount*
642(3A)	Three Person Survey Party								
All Required	Contingent Sum	C.S.	20,000.00	C.S.	20,000.00	C.S.	20,000.00	C.S.	20,000.00
642(6)	Replace Existing With Primary Monument								
20	Each	700.00	14,000.00	500.00	10,000.00	750.00	15,000.00	500.00	10,000.00
643(2)	Traffic Maintenance								
All Required	Lump Sum	L.S.	200,000.00	L.S.	165,000.00	L.S.	400,000.00	L.S.	250,000.00
643(2)-1	Bridge RepairTraffic Maintenance Setup								
10	Each	15,000.00	150,000.00	10,000.00	100,000.00	35,000.00	350,000.00	35,000.00	350,000.00
643(3)	Permanent Construction Signs								
All Required	Lump Sum	L.S.	5,000.00	L.S.	10,000.00	L.S.	4,000.00	L.S.	5,000.00
643(23)	Traffic Price Adjustment								
All Required	Contingent Sum	C.S.	0.00	C.S.	0.00	C.S.	0.00	C.S.	0.00
643(25)	Traffic Control								
All Required	Contingent Sum	C.S.	800,000.00	C.S.	800,000.00	C.S.	800,000.00	C.S.	800,000.00
644(1)	Field Office								
All Required	Lump Sum	L.S.	30,000.00	L.S.	40,000.00	L.S.	50,000.00	L.S.	30,000.00
644(2)	Field Laboratory								
All Required	Lump Sum	L.S.	15,000.00	L.S.	20,000.00	L.S.	3,500.00	L.S.	10,000.00
644(3)	Curing Shed								
All Required	Lump Sum	L.S.	5,000.00	L.S.	15,000.00	L.S.	3,500.00	L.S.	2,500.00
644(6)	Vehicles								
All Required	Lump Sum	L.S.	60,000.00	L.S.	180,000.00	L.S.	200,000.00	L.S.	100,000.00
644(15)	Nuclear Testing Equipment Storage Shed								
1	Each	10,000.00	10,000.00	4,000.00	4,000.00	3,500.00	3,500.00	2,500.00	2,500.00
645(1)	Training Program, 4 Trainees/Apprentices								
2,000	Labor Hour	1.00	2,000.00	1.00	2,000.00	1.00	2,000.00	10.00	20,000.00
646(1)	CPM Scheduling								
All Required	Lump Sum	L.S.	3,000.00	L.S.	1,000.00	L.S.	500.00	L.S.	1,000.00
660(126)	Roadway Weather Information System Components								
All Required	Contingent Sum	C.S.	6,000.00	C.S.	6,000.00	C.S.	6,000.00	C.S.	6,000.00
669(1)	Automatic Vehicle Classification								
All Required	Lump Sum	L.S.	20,000.00	L.S.	100,000.00	L.S.	142,000.00	L.S.	100,000.00
670(10)	Methyl Methacrylate Pavement Markings								
All Required	Lump Sum	L.S.	300,000.00	L.S.	388,000.00	L.S.	400,000.00	L.S.	300,000.00
670(12)	Methyl Methacrylate Transverse Markings, Words and Symbols								
30	Each	250.00	7,500.00	1,000.00	30,000.00	360.00	10,800.00	500.00	15,000.00
Total Basic Bid			**26,775,562.00**		**28,866,903.50**		**29,587,321.00**		**29,596,718.87**

Project Summary: Includes Basic Bid

	ENGINEER'S ESTIMATE	LOW BIDDER	BIDDER 2	BIDDER 3
Bid Total:	**26,775,562.00**	**28,866,903.50**	**29,587,321.00**	**29,596,718.87**

COMPILATION OF BIDS

STATE OF ALASKA -- DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES -- NORTHERN REGION

Federal No:	IM-0A4-4(15)	Opened at:	Fairbanks, AK
AKSAS No:	61275	Date:	Wednesday, November 27, 2013
Project Name:	Parks Highway M P 239-252 Rehabilitation	By:	Barbara L. Tanner, P.E.
Project Location:	Mp 239-252		

Other Bidders: Includes Basic Bid			
	HC CONTRACTORS, INC P.O. BOX 80688 FAIRBANKS, AK 99708 Phone:907-488-5983 Fax:907-488-9830		
Bid Total:	30,135,193.50		

APPENDIX C

Polyester Concrete Special Provision

Add the following Section:

SECTION 525
POLYESTER CONCRETE OVERLAY

525-1.01 DESCRIPTION. Furnish, place, finish, and cure polyester concrete (PC) overlay at the locations shown in the Plans.

525-2.01 MATERAILS. Use materials that conform to the following:

Polyester Concrete	Section 731
High-Molecular Weight Methacrylate (HMWM) Resin	Section 731
Fine Aggregate	Section 731
Coarse Aggregate	Section 731
Sand for Abrasive Finish	Section 731

CONSTRUCTION REQUIREMENTS

525-3.01 SUBMITTALS AND QUALITY CONTROL. Do not order materials for the polyester concrete or begin polyester concrete work, including surface preparation, until receiving approval of the Mix Design and Work Plan.

1. Mix Design. At least 30 days before placement submit a PC mix design that meets the polyester binder manufacturer's recommendations. Include at least the following:

    a. The brand of the PC and test results showing conformance with Section 731.
    b. The weight of polyester binder per cubic yard of polyester concrete
    c. The weight of coarse and fine aggregate in kiln-dried condition per cubic yard of PC
    d. Coarse and fine aggregate gradation, absorption, and quality test results
    e. Sand gradation and absorption test result
    f. Recommended initiator percentage for the expected application temperature and a calculated yield of PC (in cubic feet) per unit volume of resin binder.
    g. Aggregate moisture content required at the time aggregate is mixed with polyester binder
    h. Initial set time for polyester concrete
    i. Cure time for polyester concrete
    j. Material safety data sheets for all polyester binder components

2. Work Plan. At least 30 days before placement, submit work plans that meet the PC manufacturer's recommendations for each trial section and overlay. Include at least the following:

    a. Schedule of work
    b. Testing procedures and frequencies
    c. Description of equipment and procedures for surface preparation and collection and containing the HMWM resin and abrasive blasting materials
    d. Description of equipment and procedures for furnishing, measuring, mixing, placing, finishing, and curing the polyester concrete
    e. Description of equipment and procedures for furnishing and applying sand
    f. Method for storage and handling of polyester concrete components
    g. Method for disposal of excess PC, polyester binder, and containers

3. Material Health and Safety Training and Precautions. Provide supplier-furnished health and safety training for the personnel who are to handle, work with, and inspect the PC and HMWM resin prime coat. Complete training prior to the PC materials arriving at the site.

4. Containment. Contain the HMWM resin and abrasive blasting materials and restrict to the surface receiving the PC only. Do not allow the materials to escape to the surrounding environment.

5. Technical Experience. Employ on-site supervisors and personnel operating the mixer and finishing machines, who have successful previous experience in mixing and a placing polyester concrete overlay on at least three projects in the last five years where no price adjustment was made due to workmanship or material failure. Provide documentation including at least the following:

    a. Name and location of the project
    b. Contracting Agency of the project
    c. Name and current phone number of the Contracting Agency's contact for the referenced project
    d. Area quantity of overlay placed

    Have a qualified representative from the material supplier on-site during the overlay of the full-length of the first traffic lane to supervise and furnish technical service relating to proper surface preparation, and mixing and application of the material.

6. Trial Section. No more than 2 days prior to beginning overlay operations, place, cure and finish a Trial Section of polyester concrete. The Trial Section may be placed on a test slab, or a section of the bridge deck, prepared in accordance with the Contract. Meet the following:

    a. Construct a Trial Section that is a minimum of 12 feet wide by 12 feet long by the thickness shown on the Plans
    b. Use the same equipment as the production work
    c. Replicate field conditions for the production work
    d. Demonstrate suitability of the proposed means and methods
    e. Verify the initial set time and cure time

    Trial Sections placed on the bridge deck that conform to the Contract may be incorporated into the completed work. Remove, dispose, and replace Trial Sections placed on the bridge deck that do not conform to the Contract at no addition cost to the Department.

    Test slabs are the Contractor's property. Remove and dispose of the test slab after the Trial Section has been approved. Remove, dispose, and replace Trial Sections placed on test slabs that do not conform to the Contract at no additional cost to the Department.

    If the Trial Section shows the submitted mix design needs to be modified, submit a modified PC mix design meeting Subsection 525-3.01.1 at least one day before placing the production overlay. Do not commence overlay operations until the Trial Section has been approved in writing.

525-3.02 SURFACE PREPARATION.

1. Clean. Abrasive blast clean the lane, strip, or overlay joint being overlaid of loose particles, dust, oil, grease, rust, or other foreign materials that may reduce the bond of new to old concrete.

2. Protect. Prevent equipment from contaminating the surface with oil or grease before placing the overlay. When using an air supply system for blast cleaning and blowing, ensure there is an oil trap in the air line.

    Confine removal of concrete to areas at least 100 feet from the defined limits of any final cleaning or overlay placement in progress. If the Engineer determines that the removal operation is impeding or interfering in any way with final cleaning or overlay placement, stop the removal work immediately and move removal equipment far enough from the area being prepared or overlaid.

    If the water and contaminates from concrete deck removal could flow into the area being prepared or overlaid because of the grade, suspend removal operations for the first 24 hours of curing time after the concrete is placed.

When final preparation begins, stop removing concrete by mechanical methods and stop cleaning in areas adjacent to a lane or strip being cleaned. Do not resume removing concrete by mechanical methods until placing the concrete and satisfying the curing-time requirement based on the manufacturer's recommendation. Suspend sandblasting and cleaning for the first 24 hours of curing time after the concrete is placed.

If the lane or strip being overlaid becomes contaminated after final cleaning, sandblast the surface before placing the overlay. Begin polyester concrete placement within 24 hours of completing surface preparation for the portion of the deck to be overlaid.

Do not permit traffic on any portion of the lane or strip prepared for concrete placement, without approval. Prevent contamination of prepared lanes or strips from equipment after final cleaning.

525-3.03 APPLICATION OF PRIME COAT. Do not begin application of the HMWM prime coat and the polyester concrete if rain is expected. The area receiving the prime coat shall be dry and had no rain within the past 12 hours. Immediately prior to applying the prime coat, sweep clean the surfaces to be overlaid by compressed air to remove accumulated dust and any other loose material.

Place the prime coat when the ambient temperature is between 50^{o}F and 100^{o}F and the relative humidity is not more than 85 percent, or according to the polyester concrete manufacturer's instructions.

Apply one coat of promoted/initiated wax-free HMWM resin to the prepared concrete and steel surfaces immediately before placing the polymer concrete. Work the promoted/initiated resin onto the concrete in a manner to assure complete coverage of the area receiving polyester concrete.

Provide a one-pint sample of promoted/initiated HMWM resin at random intervals as directed by the Engineer. Submit the sample at the time of primer application to verify proper catalyzation.

Cure the prime coat according to the polyester concrete manufacturer's recommendations before beginning placement of the polyester concrete. Do not proceed with placement of the polyester concrete until the Engineer verifies that the HMWM resin was properly promoted and initiated, as evidenced by the HMWM batch sample.

If the primed surface becomes contaminated, abrasive blast clean and reprime the contaminated area at no additional cost to the Department and at no extension of contract time.

Do not allow resin to run into drains or expansion joints, or otherwise escape the collection and containment system.

525-3.04 MIXING POLYESTER CONCRETE.

1. Equipment. Mix polyester concrete in accordance with the approved mix design. Use mixers that are clean and free of oily residue. Record the aggregate and resin volumes for each batch along with the date of each recording. Furnish the recordings to the Engineer at the end of each work shift.

   Prevent any cleaning chemicals from reaching the polyester mix during the mixing operations.

2. Components. Determine the exact percentage of polyester resin binder in the polyester modified concrete as approved by the Engineer.

   Use an amount of peroxide initiator that results in a polyester concrete set time between 30 and 120 minutes during placement. Accelerators or inhibitors may be required as recommended by the polyester concrete supplier and as approved.

   Initiate and thoroughly blend the polyester resin binder just prior to mixing the aggregate and binder. Thoroughly mix the polyester concrete prior to placing.

525-3.05 POLYESTER CONCRETE PLACEMENT. Place the polyester concrete on the liquid or hardened prime coat within 2 hours of placing the prime coat. Place polyester concrete prior to gelling and within 15 minutes following initiation, whichever occurs first. Discard polyester concrete that is not placed within this time.

If polyester concrete is not placed over the prime coat within the 2-hour time limit, apply a fresh coat of HMWM resin primer immediately followed by an abrasive sand finish coating. Broadcast the abrasive sand finish onto the surface to affect a uniform coverage of a minimum of 0.8 lb/yd^2. Prior to applying the polyester concrete overlay, re-clean the surface in accordance with Subsection 525-3.02.

Ensure the surface temperature of the area receiving the polyester concrete shall be the same as specified above for the HMWM prime coat.

Do not allow the polyester mixture to run into drains or expansion joints, or otherwise escape the collection and containment system.

Consolidate the polyester concrete to a relative compaction of not less than 97 percent as determined by California Test 552.

Create cold joints by sloping the polyester concrete downwards at a 45 degree angle. Prior to the next placement operation, abrasively blast the cold joint and coat the joint with HMWM primer.

525-3.06 FINISHING POLYESTER CONCRETE. Finish polyester concrete to the required grade and cross section using finishing equipment. Finish equipment for polyester concrete must:

1. Have grade control capabilities resulting in a roadway surface that meets the smoothness requirements specified and is capable of adjusting for a variable thickness overlay along and across the existing deck surface.
2. Be used to consolidate the polyester concrete.
3. Have a 12-foot minimum paving width.
4. Be self-propelled and equipped with automatic screed controls and sensing devices that control he thickness, longitudinal grade, and transverse screed slope. Do not advance the finishing equipment with winches or pulling devices.

Groove the bridge deck surface in a longitudinal direction with grooves that are 1/8 to 3/16 inches wide by 3/16 to 5/16 inches deep, spaced at 1.25 to 1.5 inches on center. Do not damage expansion joints and deck drains. Terminate grooves no more than 12 inches away from curb faces.

Give the polyester concrete an abrasive sand finish. Apply the sand finish by hand immediately after strike-off and before gelling occurs. Broadcast sand onto the surface to affect a uniform coverage of a minimum of 0.8 lb/yd^2.

Give the polyester concrete a uniform surface texture. Provide a polyester concrete surface with a coefficient of friction not less than 0.35 as determined by ASTM E1911. Polyester concrete friction acceptance tests will be conducted at locations determined by the Engineer at a minimum frequency of once per lane.

After initial finishing, power sweep the overlay to remove excess loose aggregate and abrasive sand and allow time for inspection. Demonstrate to the satisfaction of the Engineer that the power broom equipment will not damage the finished overlay. Repair damage to the finished overlay caused by the power broom at no additional cost to the Department.

The polyester overlay may require grinding of rough areas as determined by the Engineer. Perform the grinding in a manner that will not damage the existing bridge deck. Do not use rotary milling machines. Demonstrate to the satisfaction of the Engineer that the method and equipment for grinding the polyester

overlay are adequate for the intended purpose and will provide satisfactory results. Do not commence removal until receiving approval of the grinding equipment.

Contain, collect, and dispose of all concrete debris generated by the grinding and grooving operations.

525-3.07 CURING POLYESTER CONCRETE. Do not permit traffic and equipment on the polyester concrete until a minimum of 4 hours after final finishing and until the polyester concrete has achieved a minimum compressive strength of 2,500 psi as determined by the rebound number per ASTM C805.

Remove and replace areas of polyester concrete that do not completely cure or that fail to attain the specified minimum compressive strength in 6 hours at no additional cost to the Department.

525-3.08 SURFACE TOLERANCE. The Engineer will test the finished surface of the overlay using a straightedge 10 feet long. Correctively grind areas where variations in the overlay surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse, exceeds 1/8 inch. After corrective grinding, the Engineer will retest the surface to verify compliance with the specified tolerance.

Use an approved grinding machine. Do not use brush hammers or other impact devices. Re-establish a uniform texture in areas requiring corrective grinding that is as equal as possible to the surrounding, uncorrected, bridge deck.

525-3.09 POLYESTER CONCRETE BOND. After the requirements for curing have been met, sound the entire overlaid surface, in a manner approved by and in the presence of the Engineer, to ensure total bond of the concrete to the bridge deck. Remove and replace unbonded PC areas with new polyester concrete at no additional cost to the Department and at no extension in contract time.

Fill and seal cracks with HMWM resin. Fill cracks 1/16 inch to 1/8 inch in width with two applications of HMWM resin. Submit for approval a repair plan for cracks 1/8 inch and wider and areas of cracking greater than 1 square foot. Immediately following the application of HMWM resin, coat the wetted surface with sand for abrasive finish.

525-4.01 METHOD OF MEASUREMENT. Section 109.

525-5.01 PAYMENT. The lump sum price includes full compensation for surface preparation, priming, furnishing, placing, finishing, curing, and protecting the PC overlay.

Test slabs, Trial Sections not incorporated into the completed work, training, and on-site supervision from the manufacturer's representative are subsidiary.

Corrective grinding and crack repairs are subsidiary.

Payment will be made under:

Pay Item	Pay Unit
525(1) Polyester Concrete Overlay	Lump Sum

Add the following Section:

SECTION 731
POLYESTER CONCRETE

731-1.01 SCOPE. Polyester concrete for use in bridge deck overlays composed of polyester resin binder, HMWM resin, and aggregate.

731-2.01 POLYESTER RESIN. Use an unsaturated isophthalic polyester-styrene co-polymer resin that conforms to Table 731-1.

TABLE 731-1
POLYESTER RESIN BINDER

Property	Requirements	Test Method
Viscosity[a]	75 to 200 cps (20 rpm at 77°F)	ASTM D2196
Specific Gravity[a]	1.05 to 1.10 at 77°F	ASTM D1475
Elongation	Min. 35%, Type I specimen, 0.25±0.03 inch thick Rate = 0.45 inch/min. Sample Conditioning: 18 hours/77°F/50% + 5 hours/158°F	ASTM D638 ASTM D618
Tensile Strength	Min. 2,500 psi Sample Conditioning: 18 hours/77°F/50% + 5 hours/158°F	ASTM D638 ASTM D618
Styrene Content[a]	45% to 50% by weight	ASTM D2369
Silane Coupler	Min. 1.0% (by weight of polyester styrene resin)	-
Static Volatile Emission[a]	Max. 60 gram/sq m loss	SCAQMD Method 309-91

[a] Test must be performed before adding initiator.

The silane coupler shall be an organosilane ester, gammamethacryloxypropyltrimethoxysilane. The promoter shall be compatible with suitable methyl ethyl ketone peroxide (MEKP) and cumene hydroperoxide (CHP) initiators.

Polyester resin binder will be accepted based on submittal of a Manufacturer's Certificate of Compliance conforming to Subsection 106-1.05.

731-2.02 HIGH MOLECULAR WEIGHT METHACRYLATE (HMWM) RESIN. Use a HMWM resin that conforms to Table 731-2. Use a promoter/initiator system for the HMWM resin consisting of a metal dryer and peroxide.

TABLE 731-2
HMWM RESIN

Property	Requirements	Test Method
Viscosity, min.	25 cps (Brookfield RVT w/UL adapter, 50 rpm at 75°F	California Test 434
Density	8.5 to 8.75 lb/gal at 75 °F	ASTM D1475
Flash Point	Min. 180 °F	ASTM D93

Tack-Free Time	Max. 400 minutes	California Test 551

Prior to adding initiator, the HMWM resin shall have a maximum volatile content of 30 percent, when tested in conformance with ASTM D2369.

HMWM resin will be accepted based on submittal of a Manufacturer's Certificate of Compliance conforming to Subsection 106-1.05.

731-2.03 AGGREGATE. Submit a Manufacturer's Certificate of Compliance conforming to Subsection 106-1.05 for fine aggregate, coarse aggregate, and sand for abrasive finish.