Charlie A. Dooley
County Executive

Saint Louis
COUNTY
HIGHWAYS & TRAFFIC
PUBLIC WORKS

Sheryl L. Hodges, D.E., P.E., L.P.G.
Director

September 5, 2012

ADDENDUM NO. 2

Notice to All Persons and Firms Proposing
to Submit a Bid or Furnish Materials for
Midland Boulevard Infrastructure
St. Louis County Project No. AR-1310
Federal Project No. STP-4900(621)

The construction contract for this project has been revised as follows:

No. 1

Add the following attached Special Provision:

1100.70.8 TRANSVERSE AND LONGITUDINAL JOINT PAVEMENT REPAIR (6-FOOT MINIMUM WIDTH) WITH SPECIAL CONCRETE TYPES AND CONSTRUCTION PROCEDURES

No. 2

Delete the following Special Provision: 1100.70.6 PAVEMENT REPAIR AT TRANSVERSE JOINT.

No. 3

Delete the following Special Provision: 1100.70.7 SPECIAL CONCRETE TYPES AND CONSTRUCTION PROCEDURES.

No. 4

Add the following Special Provision:

1200.30.2 WEDGE AND LEVEL (AR-1310)

Separate quantities and bid item for wedge and level have not been included in the contract. It is anticipated that wedge and level will be necessary on some of the roadways and shall be performed in accordance with Sec 404.21.7. If, after the pavement surfacing and texturing operations are completed, the Engineer requires wedge and level of:

A. Less than 1 inch in depth, SP 95 (PG 70-22)CLP shall be used and be paid at the contract unit price for Item No. 404-12.71 "Superpave Asphaltic Concrete Mixture SP 125 (PG70-22)CLP".

B. 1 inch up to less than 3 inches, SP 125 (PG70-22)CLP shall be used and paid at the contract unit price for Item No. 404-12.71 " Superpave Asphaltic Concrete Mixture SP 125 (PG70-22)CLP".

C. 3 inches or greater, SP 190 (PG64-22)D shall be used and paid at the contract unit price for Item No. 404-12.71 " Superpave Asphaltic Concrete Mixture SP 125 (PG70-22)CLP".

No. 5

The OPTION FOR BITUMINOUS MATERIALS COST ADJUSTMENTS sheet in the Bid Documents is revised as follows:

In paragraph 2, replace "month & year" with "August 2012."

No. 6

The Addendum Acknowledgement Form for Addendum No. 1 was inadvertently not included and is included as an attachment to this Addendum No. 2.

Sincerely,

for Daniel R. Naunheim, P.E.
Division Manager, Design

DRN/HH/dmd

Attachments: *Special Provision 1100.70.8 Transverse and Longitudinal Joint Pavement Repair (6-Foot Minimum Width) with Special Concrete Types and Construction Procedures and Addendum Acknowledgements 1 & 2* ***(Please sign and return.)***

1100.70.8 TRANSVERSE AND LONGITUDINAL JOINT PAVEMENT REPAIR (6-FOOT MINIMUM WIDTH) WITH SPECIAL CONCRETE TYPES AND CONSTRUCTION PROCEDURES

Delete Section 613 and substitute the following:

613.1 Description

613.1.1 Full depth pavement repair shall consist of removing specified areas of existing variable thickness of non-reinforced Portland Cement Concrete and replacing with reinforced or non-reinforced Portland Cement Concrete as specified in the contract documents.

613.1.2 Pavement repair greater than 15 feet in length shall be reinforced with welded wire reinforced specified herein.

613.1.3 Pavement repair thickness may be increased by up to 2 inches at no additional cost to the county, to meet the required opening compressive strength.

613.1.4 Pavement repair that does not meet the required opening and 7-day compressive strengths as specified in Sec 613.3.29.2 will be considered by the engineer to be a temporary repair and subject to removal and replacement.

613.1.5 Due to high volumes of traffic on most of the roadways where work is to be performed, bid items and quantities for fast setting concrete have been included to allow the Engineer and Contractor some flexibility in dealing with lane closures, traffic control and access to streets and driveways. The Engineer shall have final approval over the type of concrete to be used. Payment as approved by the Engineer shall be made under the appropriate bid items.

613.2 Materials

All materials, unless specified otherwise in this specification, shall conform to Division 1000, Materials Details, and specifically as follows:

Item	Section
Bituminous Materials	1015
Reinforcing Steel for Concrete	1036
Epoxy Resin Material	1039
Concrete Admixtures	1054
Concrete Curing Material	1055
Material for Joints	1057

613.3 Construction Requirements

613.3.1 Pavement Removal Locations. Approximate locations and areas of pavement sections to be removed will be shown on the plans. Specific locations and areas of pavement repair removal shall be as specified by the Engineer.

613.3.2 Pavement Removal and Base Replacement. Specified areas of full depth pavement repair shall be removed in accordance with the applicable requirements of Section 202.30 except that the saw-cut shall be full-depth for pavement thickness of 7 inches or greater. A diamond saw shall be used for perimeter cuts, and saw-cuts shall not be made more than one calendar day before concrete slab removal. Saw cut such that traffic will not dislodge any pieces or segments. A rock saw may be used to make this cut with prior approval of the Engineer. Any damage caused to the pavement due to pre-sawing shall be repaired by the contractor at the contractor's expense. Asphalt backfill and maintenance of saw cut will be at no cost to the County.

613.3.2.1 Pavement Repair Breaking and Removal. Inside the saw cut outline, do not impact the surface within 18 inches of the pavement to remain in place. The full depth of pavement shall be removed from the middle-portion of the slab toward the adjacent concrete to be used-in-place, with a minimum disturbance of sound base. For pavement repair less than 7 inches in thickness and when removing concrete within six (6) inches of a sawed or formed joint, only use a 15-pound jackhammer to remove excess concrete.

613.3.2.2 Pavement Repair Base Removal and Compaction. Any aggregate base disturbed by the Contractor shall be recompacted or removed and backfilled with Portland Cement Concrete as an integral part of the repair. Unstable base aggregate shall be removed and replaced in accordance with Section 304, as directed by the Engineer. Subgrade compaction shall be performed in areas of unstable subgrade in accordance with Section 210, if directed by the Engineer. In areas of unstable subgrade, the unstable subgrade may be removed and replaced with Type 5 aggregate base material in accordance with Section 304 at the Contractor's option. Compaction shall be in accordance with Section 304 and to the satisfaction of the Engineer.

613.3.2.3 Base Repair Forming. Forming for concrete pavement repair shall be in accordance with Section 502 of the standard specifications.

613.3.2.4 Undercut Spalling. When concrete removal operations result in deterioration of the bottom slab of sound concrete surrounding the repair area the Contractor shall saw back into the adjacent slab until sound concrete is encountered.

613.3.2.5 Removal of Excess Water. The repair area shall be dry, free from standing water. The Contractor shall pump water from the repair area or drain it through a trench cut into the shoulder. The base shall be recompacted in accordance with Sec 304.3.5.2 and to the satisfaction of the Engineer.

613.3.3 Transverse Joint Reinforcement. Transverse joints shall be provided in accordance with Sec 505.2.4.

613.3.3.1 Dowel Bar Installation. Dowel bar diameter shall be based on repair thickness. Horizontal displacement is defined as difference in the actual dowel bar location from its theoretical position as detailed in the standard details. The maximum allowable horizontal displacement is 2 inches. The dowel holes shall be drilled on 12" centers, located vertically at mid-depth ± ½ inch of the slab drilled, drilled with an automatic gang-mounted dowel drilling rig, referenced off the slab surface. Single, hand-held drills are not permitted because of the likelihood of misalignment. Standard pneumatic and hydraulic percussion drills are acceptable for drilling dowel bar holes. The drilling rig shall be able to maintain proper bar alignment, drilled to required diameter + 1/8 inch,

and to a depth approximately ½ the length of the dowel bar. Dowel bars shall have a typical spacing of 6 inches from any longitudinal joint or edge of pavement. The holes shall be blown clean and allowed to dry.

613.3.3.2 Dowel Bar Epoxy Anchoring. The holes shall be injected with an epoxy bonding agent meeting the requirements of Section 1039.3 of the current St. Louis County Standard Specifications for Highway Construction. If the epoxy bonding agent is either in bulk or cartridge form, it shall be thoroughly mixed in the proper ratio by an automatic mixing unit prior to injection into the dowel holes. The automatic mixing unit shall be an integral part of the injection device. The bonding agent shall be injected into the dowel hole by inserting the injection device to the back of the hole and slowly withdrawing the device while dispensing sufficient material to completely fill the void around the dowel when the dowel is inserted.

613.3.3.3 Dowel Bar Insertion. Prior to inserting the dowel into the hole, a thin plastic disk, manufactured to slip tightly over the dowel, shall be placed over the dowel at approximately midpoint to prevent the bonding agent from flowing from the hole during placement of the dowel and to create an effective face at the entrance of the dowel hole. The dowel shall be inserted into the hole with a twisting motion so the material in the back of the hole is forced up and around the dowel. The dowel shall be placed parallel to the surface and the centerline of the travel way and shall not vary more than ¼ inch in alignment. Dowels shall be firmly seated prior to placing concrete.

613.3.3.3.1 Dowel Bar Alignment Tolerance. Dowel bar(s) that vary more than ¼ inch per 12 inches of bar in horizontal skew or vertical tilt alignment on more than three bars shall be cause for removal of the dowels, re-sawing the pavement repair boundaries beyond the embedded bar, removing the concrete and re-installing the dowel bars for the full length of the repair joint. No additional compensation will be made for removal and replacement of dowels and concrete pavement and other incidentals associated with their replacement.

613.3.4 Longitudinal Joint Reinforcement Installation. Tie bar size shall be based on repair thickness. The 30" long steel epoxy coated No. 5 or No. 6 round deformed dowel bar, in accordance with Sec 1057.4, shall have holes drilled on 30-inch centers that are located vertically at mid-depth ± ½ inch of the slab drilled, 1/8 inch in diameter larger than the actual bar diameter required, to a depth approximately ½ the length of the tie-bar drilled with an automatic gang-mounted dowel drilling rig, referenced off the slab surface. Single, hand-held drills are not permitted because of the likelihood of misalignment. Standard pneumatic and hydraulic percussion drills are acceptable for drilling tie-bar holes. Tie bars shall have a typical spacing of 15 inches from any transverse joint or edge of pavement. Horizontal displacement is defined as difference in the actual dowel bar location from its theoretical position as detailed in the standard details. The maximum allowable horizontal displacement is 2 inches. The holes shall be blown clean and allowed to dry.

Longitudinal Joint Reinforcement

Pavement Repair Thickness (T), inches	Epoxy-Coated Longitudinal Tie Bars		
	Joint Type	Tie Bar No. Size x Length, inches	Tie Bar Spacing, CTR-CTR, inches
T < 7	B, F	No. 5 x 30	30
7 ≤ T < 9	B, E, F, H	No. 5 x 30	30
9 ≤ T < 11	B, E, F, H	No. 5 x 30	30
T ≥ 11	B, E, F, H	No. 6 x 40	30

613.3.4.1 Tie Bar Epoxy Anchoring. The holes shall be injected with an epoxy bonding agent meeting the requirements of Section 1039.3 of the current St. Louis County Standard Specifications for Highway Construction. A standard keyway section shall be provided for pavement repair depths 7 inches or greater wherever new pavement widening is to abut a full depth pavement repair section.

613.3.4.2 Tie Bar Alignment Tolerance. Tie bar(s) that vary more than ¼ inch per 12 inches of bar in horizontal skew or vertical tilt alignment on more than three bars shall be cause for removal of the bars, re-sawing the pavement repair boundaries beyond the embedded bar, removing the concrete and re-installing the dowel bars for the full length of the repair joint. No additional compensation will be made for removal and replacement of dowels and concrete pavement and other incidentals associated with their replacement.

613.3.5 Reinforcement. Pavement repair sections longer than 15 feet or when specified will be reinforced with welded steel wire reinforcement in accordance with Sec 505.2.1. Welded steel wire reinforcement for concrete pavement shall be in accordance with Section 1036.4 of the standard specifications. The welded wire reinforcement shall be supplied in either flat sheets or hinged sheets of the size and design shown below. Longitudinally hinged wire reinforcement for sheets of a required width of 8 feet or greater may be used. All steel welded wire reinforcement shall be free from dirt, paint, oil, grease, thick rust and other foreign substances. Thin powdery rust will be acceptable.

613.3.5.1 The flat sheet welded wire reinforcement is to be placed between the forms, or between the pavement edges, leaving 2 inches between the ends of the wires and the side forms, pavement edge, utility casting, transverse joint,

613.3.5.2 Wire Spacing, Size, Lap Splicing and Support Spacing. Wire spacing, size (longitudinal wire spacing x transverse wire spacing – longitudinal wire size x transverse wire size) and direction support spacing for concrete pavement shall be ordered by the pavement thickness criteria in accordance with Sec 505.2.1.2.

613.3.5.2.1 Support Spacing. Supports spacing for all wire reinforced concrete pavements shall in be accordance with Support Direction Spacing table. Plastic or wire bar supports, such as chairs and bolsters, shall conform to industry practice as described in the WRI "WWR-500, Manual of Standard Practice" or "TF 702 – Supporting WWR".

WWR Support Direction Spacing

Spacing (feet)	
Longitudinal	**Transverse**
2-3	3-4

613.3.5.2.2 Lap Splicing. Lap splice lengths are a minimum of one wire space plus 2 inches for plain wire and 8 inches for deformed wire.

613.3.5.2.3 Wire Spacing Substitution. There shall be no substitutions of different wire transverse or longitudinal spacing. The contractor may substitute wire size when approved in advance by the Engineer. The substituted wire size shall have equivalent or larger reinforcement area than needed for design or as shown in the contract documents.

613.3.5.3 Macro-Synthetic Fiber Substitution. The contractor is allowed a no-cost substitute of macro-synthetic fiber blend in place of welded wire reinforcement. Fiber manufacturer, brand and weight per cubic yard shall be included in the concrete mix design and on concrete delivery ticket. Fibers shall meet the minimum requirements in accordance with Sec 505.2.3. The concrete producer-supplier is required to obtain and submit the following macro-synthetic fiber information for review:

- Specific product brand name;
- Independently performed test results (include minimum average residual strength at dosage rate specified);
- Material Safety Data Sheet;
- Technical Data Sheet;
- Contact person's name, title, address, email address, and phone number;
- A letter stating the subject material will not be changed without prior written notification to the county.

613.3.5.3.1 Macro-Synthetic Approved Sources. The following sources are considered approved for use as macro-synthetic fiber for concrete reinforcement at a rate of 5 pounds per cubic yard for pavement repair:

Suggested Macro Fiber Material by Source and Trade Name

Source	**Fiber Trade Name**
BASF Construction Chemical-Admixture Systems	MasterFiber™ MAC 100
Euclid Chemical Company	TUF-STRAND SF
Forta Corporation	Fort A-Ferro® Fiber
Fabpro	Performax
General Resources Technology, Inc.	Advantage Structural Fiber
Propex Concrete Systems	Novomesh 950 Fibermesh 650
PSI Packaging, Inc.	Max Ten
W.R. Grace & Company	Strux 90/40

613.3.5.3.2 Macro-Synthetic Fiber Storage, and Handling. Macro-synthetic fiber blend material shall be delivered, stored, handled, and mixed in accordance with Sec 505.2.3.1.

613.3.6 Repair Removal and Waste Disposal. Repairs shall be made to only one lane at a time. The removed concrete and any excavated subgrade material shall be disposed of at a location furnished by the Contractor or at locations on the right-of-way approved by the Engineer. If the material is disposed of outside the right-of-way, an acceptable written agreement executed with the property owner on whose property the material is placed shall be submitted by the Contractor.

613.3.7 Crack Relief. Crack relief is required at all locations where the repair is intersected by a full-depth pavement crack. Establish crack relief by installing and securing to the slab face a 1/4 inch thick by 3 inch wide (minimum) commercial quality polyethylene, flexible foam expansion material across the crack prior to concrete placement. Extend the isolation joint material from flush with the top of pavement repair to the base of the pavement with the full-depth crack. Maintain the isolation joint material in a vertical position throughout the entire thickness of the repair.

613.3.8 Early Opening to Traffic Concrete Mix Design. The contractor shall provide trial mix data that verifies the slump, air content, minimum compressive strength and minimum opening times are achieved. All mixes shall have fine aggregate proportioned at a minimum amount of 40 percent of the total aggregate volume. Suggested County mix designs may be used or the contractor may submit an alternative mix design for review and approval.

613.3.8.1 Mix designs shall be prepared by an AASHTO accredited laboratory in accordance with the appropriate sections of ASTM C 94, ASTM C 192, ACI 211.5R-01, ACI 301, and ACI 318 Chapter 5. When the contractor submits alternative mix designs and tests results, the Contractor shall provide the Engineer that certified concrete technicians have been used as follows:

- That an American Concrete Institute (ACI) Certified Concrete Field Testing Technician, Grade I, or approved equal, has been used to:

  Measure temperature, slump, air content and unit weight of trial batch.

  Cast a total of nine 4" x 8" cylinders from the trial batch for opening compressive strength, 7-day compressive strength, and 28-day compressive strength and

- That an American Concrete Institute (ACI) Certified Concrete Strength Testing Technician, or approved equal, has been used to:

  Perform compression testing and report the early opening compressive strength (24 - 48 hour or 4 - 6 hour, and 7-day) results with 28-day compressive strengths

613.3.8.2 The contractor shall submit to the Engineer the following no less than 14 days in advance of pre-production trial batch:

- Mix Design. Pavement Repair Class, opening time, minimum opening compressive strength, sources, grade or type, and volumetric properties of the proposed concrete-mix materials (cement, coarse aggregate, fine aggregate, macro-fiber and admixture (brands and dosages), and production water/cement ratio for 1 cubic yard of concrete

Alternative mix design(s) for the class, opening time and minimum compressive strength of concrete specified,

- Curing Material Plan. The plan shall include moisture and thermal materials used to cure, cover and weight the cover materials so when placed and weighted that they remain in contact with the pavement surfaces and edges, providing an airtight enclosure during moisture and thermal curing period.

613.3.8.3 The contractor is responsible for complying with opening times, specified slump, plastic air content and minimum compressive strengths specified. The concrete for standard joint repair will be composed of materials, proportioning, air-entraining, mixing, slump, and transporting shall be in accordance with Sections 501 and 502, as applicable to concrete pavement, or as specified in this provision. Changes in the source of materials or concrete-mix proportions shall not be made without written authorization of the Engineer. Supplementary cementitious materials may be use, but are not required. Dosage of admixtures shall be determined by the manufacturer in accordance with ambient conditions expected at the time of placement. Admixture dosage shall be adjusted to achieve, slump, entrained air content, temperature and compressive strength requirements at the specified opening time. The admixture dosage shall not permit the segregation of aggregate at the time of concrete placement. Addition of non-chloride accelerating or water-reducing admixtures to increase slump after the concrete is delivered, but not discharged, is allowed only once. Failure to achieve the minimum air entrainment, concrete temperature, slump at the time of placement and compressive strength within the early opening time specified shall be cause for rejection of the mix design and the concrete placed.

613.3.8.4 The County does not warranty the performance of the following mix designs as admixture dosages are suggested and their amount can vary with cement and admixture manufacturer, ambient temperature, haul distance and batching sequence. It is required that optimum mix trials be made before the start of job site pours. This will allow the ready-mix concrete producer to determine the proper batching sequence and the required dosage of other admixtures needed to deliver the specified concrete mix to the job site. High Range Water Reducer (HRWR) is required to be added at the manufacturing plant with the Non-Chloride Accelerator (NCA) recommended to be added at the job the site.

613.3.8.5 Liquid accelerating admixtures used at dosages greater than ½ gallon per cubic yard shall be considered to add 7 pounds of water per gallon of admixture when determining the total amount of free water.

613.3.8.6 The maximum allowable total chloride content in concrete shall not exceed 0.10 percent by weight of cementitious materials. Testing shall be done in accordance with written procedural directives of the Department.

613.3.8.7 Trial Slabs. Before starting slab replacement work, the contractor shall complete a minimum of one (1) trial slab for each mix design. Trial slab(s) must be a minimum of 10 by 15 feet. The trial slab thickness must be at least 8 inches. The contractor shall produce a 4 ± 1 cubic yard pre-production trial batch at a non-critical location, at an on-site location selected by the Contractor, and agreed upon by the Engineer. The trial slabs shall be produced at approximately the same season and ambient temperature conditions as those anticipated during production. The trial slab concrete shall be manufactured, transported, constructed, finished, cured, and tested with the materials, tools, equipment, personnel, and methods to be used in completing concrete pavement repair. The Contractor shall provide the Engineer a 7-day minimum advance notification of trial batch production. The Contractor shall produce, transport, place, finish, moist cure and thermally cure the trial batch in the presence of the Engineer.

613.3.8.7.1 Contingent Item. Payment for trial slab, reinforced or non-reinforced, shall be made at the contract price for concrete pavement (Non-reinforced) for the thickness placed. If no concrete pavement pay item exists, payment for the trial slab will be made at $75.00 per square yard.

613.3.8.8 Concrete Placement. Mobile volumetric mixers are not permitted. The maximum time permitted from the end of mixing to the completion of concrete discharge shall be twenty (20) minutes. All concrete remaining in the drum after this time shall be rejected and removed from the work site. No cold joints are allowed.

613.3.8.9 Trial Slab Performance. The trial slab(s) shall demonstrate that the contractor is capable of producing slab repair in conformance with these specifications. The contractor will be required to produce additional trial batches, at their expense, if the initial trail batch fails to conform to these specifications.

613.3.9 Concrete Maturity Testing. The contractor shall be required to provide maturity loggers and assist in the development, maintenance and verification of repair's strength-maturity relationship in accordance with County Standard Specification Section 507 Strength of Concrete Using the Maturity Method, when specified or allowed. When maturity testing is required, no trial slab will commence without contractor supplied maturity loggers. The maturity curve shall be submitted to the Contractor by the Engineer after completion of the approved trial slab and at least 4 days in advance of production pavement repair.

613.3.9.1 No direct payment will be made for assistance in the development of the strength-maturity relationship and provision of loggers with appropriate length logger cables. All costs involved will be completely incidental to other items included in the contract.

613.3.10 24 - 48 High Early Strength Opening Time. For pavement repair to be made and opened to traffic between 24 and 48 hours after placement, the Type I/II Portland cement, HRWR, water/cement ratio and slump requirements shall be:

Suggested 24 – 48 Hour Early Strength Opening
7.50 sack Type I/II Cement Trial Mix Design

Property	Amount
Type I/II cement, lbs	705
Coarse Aggregate (Class D), lbs	1780
Fine Aggregate (Class A), lbs	1190
Maximum Allowable Water, lbs (gals)	240 (28.8)
Entrained Air, percent	5.5
Polycarboxylate-based HRWR (ASTM C494 Type F), ounces per cubic yard[1]	106
[1] EXP 950, Sika Sikament 610, Euclid Eucon SPC, GRT EVO 2500 or an approved equal shall be added at the manufacturing plant. Additional HRWR may be added once to increase slump	

613.3.10.1 The allowable Type I/II cement content shall not be less than 700 pounds or exceed 850 pounds per cubic yard. The contractor is allowed to use a calcium nitrite NCA. Calcium chloride accelerators are not permitted. All concrete shall have the additional properties:

Required 24-48 Hour Early Opening Mix Properties

Property	Minimum	Maximum
Water / Cement Ratio	0.25	0.36
Temperature at time of placement, °F	83	-
Slump before adding HRWR, inch	1	2
Slump at the time of placement, inch	4	6

613.3.10.2 No addition of water to the concrete shall be permitted after addition of the water-reducer. Water/cementitious ratio shall be maintained at ± 0.02 from the target established on the mix design and shall be within the minimum-maximum range when the tolerance is applied.

613.3.10.3 Applicable Pavement Repair Pay Item Descriptions. The accepted quantity for 7.5 sack pavement repair, not including trial slab(s), will be paid for at the contract unit price for each of the pay items included in the contract.

613.3.10.3.1 Joint Repair-Transverse, Type I Cement, 7.5 Sack, Item No. 613.10.17

613.3.10.3.2 Joint Repair-Longitudinal, Type I Cement, 7.5 Sack, Item No. 613.20.17

613.3.10.3.3 Contingent Item. Additional payment for Portland cement concrete pavement repair in excess of 8 inches thick shall be made at the rate of 10% of the contract unit price for the pavement repair item specified for each additional inch in excess of 8" per S.Y. as a contingent item. (Ex.: Unit Price = $40.00, Thickness = 10". Additional payment: 10%/inch x $40.00 x (10-8 inches) = $8.00 per S.Y.)

613.3.11 4 - 6 Hour Very Early Strength Opening Time. For the repair to be made and opened to traffic in 4 to 6 hours after placement, the Type I/II or III Portland cement, high-range water reducer (HRWR), water/cement ratio and slump requirements shall be:

Suggested 4 – 6 Hour Early Strength Opening
9.57 sack Type I/II Cement Trial Mix Design

Material	Amount
Type I/II Cement, lbs	900
Coarse Aggregate (Class D), lbs	1630
Fine Aggregate (Class A), lbs	1080
Maximum Batch Water, lbs (gal)	220 (26.5)
Maximum Allowable Water, lbs (gal)[2]	274 (32.9)
Air Entraining (5.5%), ounces	50
Polycarboxylate-based HRWR (ASTM C494 Type F), ounces	59
Calcium Nitrite (30% min.) Non-Chloride Accelerator (NCA) –ASTM C 494 Type C, ounces (gal)	980 (7.65)
[1]Aggregate Weights at SSD condition [2]Includes 7 pounds of water per gallon of NCA	

613.3.11.1 The allowable Type I/II cement content shall not be less than 850 pounds or exceed 940 pounds per cubic yard. Calcium chloride accelerators are not permitted.

Suggested 4 – 6 Hour Early Strength Opening
7.00 sack Type III Cement Trial Mix Design

Material	Amount
Type III Cement, lbs	658
Coarse Aggregate (Class D), lbs [1]	1850
Fine Aggregate (Class A), lbs [1]	1220
Maximum Batch Water, lbs (gal)	178 (21.4)

Suggested 4 – 6 Hour Early Strength Opening
7.00 sack Type III Cement Trial Mix Design

Material	Amount
Maximum Allowable Water, lbs (gal)[2]	224 (25.6)
Air Entraining (5.5%), ounces	49
Polycarboxylate-based HRWR (ASTM C494 Type F), ounces	100
Calcium Nitrite (30% min.) NCA ASTM C 494 Type C, ounces (6.6 gal)	842(6.6)
[1]Aggregate Weights at SSD condition [2]Includes 7 pounds of water per gallon of NCA	

613.3.11.2 The allowable Type III cement content shall not be less than 650 pounds or exceed 800 pounds per cubic yard. Calcium chloride accelerators are not permitted. Water/cementitious ratio shall be maintained at ± 0.02 from the target established on the mix design and shall be within the minimum-maximum range when the tolerance is applied. All 4-6 hour very early opening concrete shall have the additional properties:

Required 4 - 6 Hour Early Opening Mix Properties

Property	Minimum	Maximum
Type I/II Cement Water / Cement Ratio	0.25	0.32
Type III Cement Water / Cement Ratio	0.25	0.36
Temperature at time of placement, °F	83	-
Slump before adding HRWR, inch	1	2
Slump at the time of placement, inch	4	6

613.3.11.3 Applicable Pavement Repair Pay Item Descriptions. The accepted quantity for 8.5 sack pavement repair, not including trial slab(s), will be paid for at the contract unit price for each of the pay items included in the contract.

613.3.11.3.1 Concrete Base (10" Reinforced), Type III Cement w/Accelerator, 8.5 Sack, Item No. 309.12.30

613.3.11.3.2 Concrete Base (9" Reinforced), Type III Cement w/Accelerator, 8.5 Sack, Item No. 309.10.09

613.3.11.3.3 Concrete Base (8" Reinforced), Type III Cement w/Accelerator, 8.5 Sack, Item No. 309.12.38

613.3.11.3.4 Joint Repair-Transverse, Type III Cement w/Accelerator, 8.5 Sack, Item No. 613.10.90

613.3.11.3.5 Joint Repair-Longitudinal, Type III Cement w/Accelerator, 8.5 Sack, Item No. 613.20.90

613.3.11.3.3 Contingent Item. Additional payment for Portland cement concrete pavement repair in excess of 8 inches thick shall be made at the rate of 10 percent of the contract unit price for the pavement repair item specified for each additional inch in excess of 8" per S.Y. as a contingent item. (Ex.: Unit Price = $40.00, Thickness = 10". Additional payment: 10 percent / inch x $40.00 x (10-8 inches) = $8.00 per S.Y.)

613.3.12 Production Water/Cementitious Ratio Tolerance. No addition of water to the concrete shall be permitted after addition of the water-reducer. Water/cementitious ratio shall be maintained at ± 0.02 from the target established on the mix design and shall be within the minimum-maximum range when the tolerance is applied.

613.3.13 Weather Limitations. Weather limitations shall be in accordance with Section 502.4.

613.3.14 Concrete Temperature at the Time of Placement. The temperature of the concrete at the time of placement shall be no lower than 83 F.

613.3.15 Entrained Air. The quantity of air by volume entrained in early opening strength concrete shall be 5.5 ± 1.5 percent as determined in accordance with County Test Method QA-3 Air Content of Freshly Mixed Concrete by the Pressure Method.

613.3.16 Consolidation. Internal concrete vibrator(s) shall be supplied in accordance with Sec 502.3.7. Concrete shall be consolidated in accordance with Sec 502.12.1. Vibrators and equipment to operate vibrators shall be on-site and functional prior to arrival of concrete on site. No concrete shall be placed without operational vibrators.

613.3.17 If the concrete pavement has been resurfaced and where no additional structure is to be added to the existing overlay, or where the existing bituminous overlay is to be removed by milling, the repaired area shall be filled to the surface of the existing bituminous overlay with Portland cement concrete.

613.3.18 If the concrete pavement has been resurfaced and additional lifts are to be added over the existing overlay, the repair area shall be filled with Portland cement concrete to the surface of the underlying concrete pavement, and the remaining area shall be filled with approved hot-mix asphalt to the existing bituminous overlay surface. The hot-mix asphalt shall be placed in accordance with the specifications for that mix.

613.3.19 When the concrete pavement requires all milled areas to be resurfaced in the same work day prior to opening the pavement to traffic, pavement repairs identified after milling will be marked for future repair, and the area shall be resurfaced as planned for that work day. No additional lifts of hot-mix asphalt will be allowed until the marked pavement is repaired. The pavement repair shall be performed in accordance with Sec 613.3.18.

613.3.20 Strike-off. Delete Section 502.3.6 and replace with the following. The use of a vibrating screed parallel to the pavement's centerline is required for full depth repairs over 10 feet in length. For repairs 10 feet or less in length use a 10-foot straight edge, pulling the tool blade parallel to the longitudinal joint.

613.3.21 Concrete Pavement Repair Smoothness. All repaired areas shall be finished to provide a smooth ride and to the satisfaction of the Engineer. Prior to surface texturing,

repaired areas shall be checked with a straightedge in accordance with Sec 502.3.10 if required by the Engineer. When straightedged, the surface of the repaired area shall not vary more than 1/8" per 10' from a straight line between the surface of the existing pavement on each side of the repaired area, regardless if the repair is to be resurfaced or not. When the tolerance is not met, plastic concrete shall be added or removed from the repair until the surface tolerance is met.

613.3.22 Surface Texturing. No concrete shall be placed without proper texturing equipment on the job. The repair texture shall be similar to that on the surrounding pavement. For concrete not to be overlaid and placed on Arterial roads, concrete shall be finished with a wire comb in accordance with Sec 502.3.8. For all other conditions, concrete shall be finished with a burlap fabric drag in accordance with Sec 502.3.9.

613.3.23 Pavement Repair Date Stamping. Using metal dies in accordance with Sec 502.3.11 the Contractor shall stamp the pour date into the repair that is not to be overlaid after surface texturing, but before curing is applied. The placement date (MM-DD-YY) of each pavement repair shall be stamped in the plastic concrete. The stamped date shall be located near the repair's transverse and longitudinal joint on a troweled surface not closer than 1 foot to edge of pavement repair and face outward so as to be read from the near shoulder. On roadways with narrow shoulders or curbs, the numbers shall be oriented (parallel with the transverse joint) so that they can be read from the roadway in the direction of traffic flow.

613.3.24 Rain Protection. Rain protection shall be in accordance with Secs 502.3.13 and 502.17.5. No concrete shall be placed without adequate type and quantity of rain protection material on the job.

613.3.25 Curing. No concrete shall be placed without proper curing material on the job. Immediately after finishing and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured with one or more of the following methods:

613.3.25.1 Moisture Retention Curing. Moisture retention curing material is required If temperature retention material is not certified to meet the water retention requirements in this section. Material shall be on repair site prior to concrete placement. Immediately after finishing and as soon as marring of the concrete will not occur, typically within 30 minutes after placement, the entire surface of the newly placed concrete shall be cured with one of the five following moisture retention materials:

613.3.25.1.1 Polyethylene Sheeting. Polyethylene sheeting for moist curing Portland cement concrete shall have a minimum nominal thickness of 4.0 mils and be white opaque, clear or black. Polyethylene sheeting physical requirements shall be in accordance with ASTM C 171. Sheeting shall extend 12 inches beyond the edges of placement, be secured to the perimeter of the pavement repair with 15-pound minimum sand bags spaced 12 inches center-to-center, beginning at the repair edge and proceeding inward in a grid pattern over the entire placement area to ensure an air-tight enclosure.

613.3.25.1.2 White-Burlap Polyethylene Sheeting. White-Burlap Polyethylene Sheeting for moist curing shall consist of burlap weighing not less than 9 ounce/yard2 extrusion coated on one side with white opaque polyethylene of a minimum nominal thickness of 4.0 mils and meeting the requirements of ASTM C

171. Sheeting shall be secured to the perimeter of the pavement repair to ensure an air-tight enclosure in the same manner as the polyethylene sheeting. Burlap shall be maintained in a moist condition through the curing period.

613.3.25.1.3 High Performance Curing Compound. Curing compound for moist curing concrete not to be overlaid with hot mix asphalt shall consist of a high performance white liquid membrane-forming compound that conforms to the requirements of ASTM C 1315 for Type 2, Class A or B as follows:

1. Percent Solids. The curing compound shall have a minimum of 42 percent solids (total solids minus pigment) by total weight and the vehicle shall be 100 percent poly-alpha-methylstyrene (PAMS)

2. Water retention. As per ASTM C 156 the loss of water shall not be more than 0.15 kg/m2 at 24 hours and no more than 0.40 kg/m2 at 72 hours

3. Reflectance. As per ASTM E 1347, the three-day reflectance readings shall be greater than 65

4. Drying Time. As per ASTM C 1315 Part 8.3, shall set to touch in no longer than one hour after application and will be tack-free in no longer than four hours after application.

5. Application rate. Not less than 1 gal/200 ft2

6. Flash Point. As per ASTM C 1315 Part 8.3, shall have a flash point greater than 100 F

613.3.25.1.4 Tack Coat. When hot mix asphalt is to be applied immediately after compressive strength is achieved and before opening to traffic, apply SS-1H meeting the requirements of Sec 1015 and applied in accordance with Sec 407 at a rate of 0.07 to 0.10 gallon per square yard.

613.3.25.1.5 Self-Dissipating Curing Compound. When hot mix asphalt is to be applied after a minimum of 5 days after compressive strength is achieved and after opening to traffic, apply a dissipating curing compound shall be applied with material being in accordance with ASTM C 309 Type I, Class B curing compound. The application rate of at least 1 gallon per 200 square feet is required.

613.3.25.2 Temperature Retention Curing. If temperature retention material is not certified to meet the water retention requirements for water vapor transmission rate (WVTR) of the sheet material of no more than 10g/m2 when tested in accordance with ASTM E 96, then moisture retention curing or polyethylene sheeting will be required with temperature retention curing. In accordance with Sec 1058, all polyethylene sheeting will be required to be a minimum of 4.0 mils thick. After moisture retention curing is applied and has set, closed-cell curing blankets shall be used. Closed-cell curing blankets (multi-use) shall be manufactured for hot and cold weather concrete curing use in accordance with Sec 1055.4.1.4 Closed-Cell Curing Blankets (Multi-Use), and shall be certified having a minimum R-value of 3. Cover materials shall be so placed and weighted that

they remain in contact with the pavement surfaces and edges, providing an airtight enclosure in the same manner as in Sec 613.3.25.1. Application of curing blankets shall be based on ambient temperature and desired opening time in accordance with the following tables.

24-48 Hour Early Strength Opening to Traffic
Temperature Retention Requirements*

Minimum Ambient Temperature Range in Curing Period, °F	Opening Time (T), hrs		
	T ≤ 24	24 < T ≤ 36	36 < T ≤ 48
< 50**	Yes	Yes	Yes
50 - 65	Yes	No	No
> 65	No	No	No

*To reduce thermal cracking thermal curing shall be removed when the concrete temperature reaches 140° F.
** Concrete exposed to temperatures below 40 F may require additional curing blankets.

4-6 Hour Very Early Strength Opening to Traffic
Temperature Retention Requirements*

Minimum Ambient Temperature Range in Curing Period, °F	Opening Time (T), hrs
	4 ≤ T ≤ 6
≤ 80**	Yes
> 80	No

*To reduce thermal cracking thermal curing shall be removed when the concrete temperature reaches 140° F.
**Concrete exposed to temperatures below 40 F may require additional curing blankets.

613.3.26 Concrete Joint Sawing. Equipment shall be in accordance with Sec 502.3.14 and the requirements specified herein. Concrete maturity shall be used to determine the compressive strengths specified below when maturity testing is required.

613.3.26.1 Standard Concrete Saw. When a standard (water cooled diamond bladed) concrete saw is used to cut the transverse or longitudinal joint when the pavement reaches 950 psi compressive strength (before final set) the following applies:

- For pavement < 7 inches thick, saw the joint to a minimum depth of one-fourth (T/4) the specified pavement thickness.

- For pavements ≥ 7 inches thick, saw the joint to a minimum depth of one-third (T/3) the specified pavement thickness.

- Saw joints 3/8 inch ± 1/16 inch wide as measured at the time of sawing.

613.3.26.2 Early-Entry Saw. When using early-entry (dry cut, light weight) saws, only use saw blades and skid plates as recommended by the manufacturer. Perform the early entry sawing reaches 150 psi compressive strength (after initial set and before final set) as follows:

- Saw the joint 2-1/4 to 2-1/2 inches deep.

- Saw joints approximately 1/8 inch ± 1/16 inch wide as measured at the time of sawing.

613.3.27 Concrete Joint Sealing. If the repaired area is not to be resurfaced, the joints and overcut from the sawing operations shall be filled with an approved joint material. For concrete pavement not to be resurfaced, seal joints in accordance with Secs 502.13.7 through 502.13.7.6.

613.3.27.1 Sealing Crack Relief. Remove isolation joint material to a depth of 1 inch below the pavement surface. Immediately prior to sealing, the crack relief must be clean, dry, and free of all incompressible material. Seal the crack relief with hot-poured sealant as specified in Sec 613.3.27. The top of the sealant (after cooling) must be flush to 1/8 inch below the surface of the pavement.

613.3.28 Compressive Strength Requirements. For 24 to 48 hour opening repair, the opening compressive strength shall be attained based upon concrete cylinders cast in the field and broken by the Division of Construction-Materials Section. At the contractor's option, the opening compressive strength of the 24 to 48 hour mix may be determined in accordance with Sec 507. For 4 to 6 hour opening repair, the opening compressive strength shall be attained based upon concrete maturity in accordance with Sec 507. The 7-day and 28-day compressive strength shall be determined by concrete cylinder compressive strength. When the repair is to be made and opened early to traffic, the concrete shall be in accordance with the following requirements:

28-Day Minimum Compressive Strength Requirement

Property	Pavement Repair Thickness	Minimum Required, psi
28-day Compressive Strength	All thicknesses	5,000

Early Compressive Strength for Opening Requirements

Pavement Repair Class	Pavement Repair Thickness, inches	Compressive Strength for Opening to Traffic, psi[a]	
		Pavement Repair Length, 6 - 10 feet	Pavement Repair Length, > 10 feet
A	$T \leq 8$	3,000	3,600
B	$8 < T \leq 9$	2,400	2,700
C	$9 < T < 10$	2,200	2,300
D	$T \geq 10$	2,000	2,000

[a]The cure time shall be the time determined to reach the compressive strength for opening to traffic. The roadway shall not be opened to traffic in less than the early opening time specified. See Sec 613.3.29.1 when opening compressive strength is less than required and when the 7-day

Early Compressive Strength for Opening Requirements

Pavement Repair Class	Pavement Repair Thickness, inches	Compressive Strength for Opening to Traffic, psi[a]	
		Pavement Repair Length, 6 - 10 feet	Pavement Repair Length, > 10 feet
compressive strength is less than 150 percent of the opening compressive strength specified.			

613.3.29 Damaged or Defective Concrete. Rain damage, low pavement repair compressive strength at the time of opening, spalling, and transverse shrinkage cracks will be cause for rejection of the concrete. Concrete pavement not in compliance with straightedge smoothness specifications shall be corrected by grinding or removal and replacement.

613.3.29.1 The Engineer shall reject any pavement repair area that develops 1 or more transverse cracks within 21 days after placement. The contractor shall remove and replace this pavement repair with pavement repair concrete that complies with the specifications. A transverse crack is a crack running from one longitudinal edge of the panel to the other. Low pavement repair compressive strength resulting in rejection is considered when the compressive strength at opening to traffic is more than 500 psi less of the required opening compressive strength or when the 7-day compressive strength is less than 125 percent of the required opening compressive strength. Compressive strength will be determined as specified for the early opening repair required.

613.3.29.2 Pay Factor Adjustment for Low Compressive Strength of Pavement Repair. The Engineer shall adjust payment for concrete pavement repair for compressive strength as follows:

1. Payment for concrete pavement repair with an opening compressive strength greater than or equal to the specified opening compressive strength and 7-day compressive strength greater than or equal to 150 percent greater than required minimum opening compressive strength, pay is not adjusted.

2. Payment for concrete pavement repair with a 7-day compressive strength less than 125 percent of the required minimum opening compressive strength is not adjusted and no payment is made. The Contractor shall remove this concrete pavement repair and replace it at their expense with concrete pavement repair material that complies with the specifications.

3. Payment for concrete pavement repair with an opening compressive strength greater than 500 psi less than the required minimum opening compressive strength before opening to traffic is not adjusted and no payment is made. The Contractor shall remove this concrete pavement repair and replace it at their expense with concrete pavement repair material that complies with the specifications.

4. Payment for concrete pavement repair with an opening compressive strength of 10 to 500 psi less than the required minimum opening compressive strength and a 7-day compressive strength of 125 to 150 percent of the required minimum opening compressive strength, the unit price shall be reduced by the percentage in the following pay table for the quantity represented by the tests.

Compressive Strength at Opening to Traffic, (psi)	**7-Day Compressive Strength (psi)**		
	Greater than or equal to 150% greater than opening compressive strength	Less than 150% and greater than or equal to 137% of the opening compressive strength	Less than 137% and greater than or equal to 125% of the opening compressive strength
Greater than or equal to opening compressive strength	100%	95%	90%
10-250 psi less than opening compressive strength	80%	75%	70%
260 – 500 psi less than opening compressive strength	60%[a]	55%[a]	50%[a]
[a] See Sec 613.3.29.1			

629.3.29.3 Diamond Grinding. Pavement repair(s) that fail to meet the smoothness requirement shall be corrected by diamond grinding in accordance with the following.

613.3.29.3.1 Description. This work shall consist of grinding the surface of Portland cement concrete pavement repair as directed by the Engineer and as specified in these special provisions.

613.3.29.3.2 Location. Grinding shall begin and end at lines perpendicular to the pavement center line and shall be centered within the lane width. When deficient concrete repair pavement is ground, the grinding shall take place in the longitudinal direction of the traveled way, shall cover the full lane width and smoothly transition into and out of the repair.

613.3.29.3.3 Texture. Grinding concrete pavement repair must result in a parallel corduroy texture with grooves from 0.08 to 0.12 inch wide and from 50 to 60 grooves per foot of width. Grooves must be from 0.06 to 0.08 inch from the top of the ridge to the bottom of the groove.

613.3.29.3.4 Grinding concrete pavement repair constructed as part of the project that is not in compliance with straightedge smoothness specifications must comply with the following:

1. Both sides of transverse joints and cracks must have the same depth of texture. The surface must be within 0.01 foot of the lower edge of a 10-foot long straightedge when laid parallel with the centerline with its midpoint at the joint or crack.

2. If necessary, perform additional grinding to achieve the required surface smoothness. Straightedge requirements do not apply to areas abnormally depressed from subsidence or other localized causes. End straightedge testing 25 feet before and resume 25 feet after these areas.

3. Cross-slope must be uniform and have positive drainage across the traveled way and shoulder. The surface must be within 0.02 foot of the lower edge of a 10-foot long straightedge when laid perpendicular to the centerline.

613.3.29.3.5 Pavement Grinding Residue. Remove grinding residue with a vacuum attached to the grinding machine. Prevent residue from flowing across the pavement or remaining on the pavement surface. Dispose of grinding residue at an appropriate disposal facility. Do not store concrete pavement grinding residue within the highway. If authorized, the Contractor may transport liquid grinding residue to an offsite location for drying. The offsite drying location must be identified and protected under the SWPPP or Water Pollution Control Program.

613.3.29.3.6 Pavement Repair Replacement. Instead of grinding, the Contractor may remove and replace deficient concrete repair pavement at their expense. The new concrete pavement must be the same thickness as the removed pavement. Replace between longitudinal joints or pavement edges and between transverse joints. Do not remove portions of slabs.

613.4 Method of Measurement.

613.4.1 Measurement for furnishing and placing Portland Cement Concrete and welded wire reinforcement or macro-fiber will be made to the nearest 0.1 square yard.

613.4.2 Full depth pavement removal will be measured as Removal of Rigid Pavement to the nearest square yard.

613.4.3 Measurement for rock base preparation and stabilization will be made to the nearest 0.1 square yard.

613.4.4 No measurement will be made for drilling dowel or tie-bar holes, keyway construction, furnishing and installing dowels, tie-bars, epoxy or polyester bonding agent, saw cutting and removing existing concrete pavements, concrete maturity loggers, assistance with creation, verification and maintenance of concrete-maturity curve, curing, welded wire reinforcement, macro-fiber, date stamping, or for subgrade or aggregate base compaction.

613.5 Basis of Payment. The accepted quantities of pavement repair at transverse or horizontal joints or concrete base will be paid for at the contract unit price for removal of rigid pavement and for pavement repair. No direct payment will be made for: drilling and installing dowels; saw cutting pavements; subgrade or aggregate base compaction; aggregate base

material used to replace unstable grade; or other work incidental to the completed pavement repair.

613.5.1 No extra compensation for removal and replacement of temporary repair, contractor optional extra repair depth not to exceed 2 inches, corrective finishing or repairs to damaged or defective concrete will be paid.

613.5.2 The Pay Factor Percentage shown in Sec 613.3.29.2 is used for the purpose of determining penalties. The Engineer shall adjust payment for concrete pavement repair. (Ex.: Unit Price = $100.00, opening compressive strength required = 2,000 psi, actual measured opening compressive strength = 1,800 psi, actual 7-day compressive strength = 2,800 psi (which is 140 percent of the required opening compressive strength). Pay Factor Reduction: From the table, the pay factor is 75 percent, so the pay for the area in question is 75/100 x $100.00 = $75.00 per S.Y.)

September 5, 2012

ADDENDUM ACKNOWLEDGEMENT

ADDENDUM NO. 1

FROM: St. Louis County Department of Highways and Traffic

RE: Midland Boulevard Infrastructure
St. Louis County Project No. AR-1310

PACKAGE INCLUDES THIS ACKNOWLEDGEMENT AND ADDENDUM NOTICE AND NOTICE TO CONTRACTORS.
(3 pages total)

IF YOU DID NOT RECEIVE ALL PAGES, CALL (314) 615-1654.

UPON RECEIPT OF THIS PACKAGE, **PLEASE SIGN AND DATE** (IN THE INDICATED LOCATIONS BELOW), AND **FAX THIS ACKNOWLEDGEMENT TO THE DEPARTMENT OF HIGHWAYS & TRAFFIC AT (314) 615-7648** (Attn: Abdelhamid Hadjri, DESIGN DIVISION) TO VERIFY RECEIPT

COMPANY _____

RECEIVED BY _____

DATE _____

September 5, 2012

ADDENDUM ACKNOWLEDGEMENT

ADDENDUM NO. 2

FROM: St. Louis County Department of Highways and Traffic

RE: Midland Boulevard Infrastructure
St. Louis County Project No. AR-1310

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COMPANY _____

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