BOHANNAN HUSTON, INC SUBMITTAL REVIEW

TO: Star Paving Company. P.O. Box 12333 Albuquerque, NM 87195 PHONE: FAX: CONTRACTOR PROJECT NO:	FROM: BOHANNAN HUSTON, INC Courtyard I 7500 Jefferson St NM Albuquerque, NM 87109 PHONE: (505)823-1000 Fax: (505) 798-7988 BHI PROJECT NUMBER: 090422

OWNER: City of Albuquerque
PROJECT; Southwest Mesa Park & Ride
SUBMITTAL NO: 46
DESCRIPTION: Quickrete Rapid Road Repair & Rapid Road Repair Extended

SHOP DRAWING REVIEW
ENGINEER'S REVIEW & RESPONSE REQUIRED OF CONTRACTOR

[X] No Exception Taken
[ ] Make Corrections Noted
[ ] Rejected
[ ] Revise and resubmit
[ ] Submit Specified Item

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract document. The contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of constructions; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner..

Bohannan Huston, Inc.

By Roy Gibson Date 11-19-2010

(See comments for individual responses required.)

This submittal has not been checked for dimensional accuracy. Verification of dimensions is the responsibility of the Contractor.

SPECIFIC REVIEW COMMENTS MAY BE FOUND ON ATTACHED PAGES

Review Item Number	Document Reference	Review Comments
1	N/A	-The Quickcrete Rapid Road Repair & Rapid Road Repair - Extended Product No. 1242 shall be installed per manufacturers recommendation and NMDOT Technical Specification Section 533 Concrete Structure Repair

COMMERCIAL GRADE QUIKRETE

RAPID ROAD REPAIR & RAPID ROAD REPAIR-EXTENDED

PRODUCT NO. 1242

PRODUCT DESCRIPTION

QUIKRETE® Rapid Road Repair® and QUIKRETE® Rapid Road Repair® - Extended are made from a rapid hardening hydraulic cement with carefully graded aggregates to provide a permanent patch. They also contains Akali-Resistant fiberglass fibers for improved flexural performance essential for applications of severe vibration as in the repair of bridge decks. Rapid Road Repair® can be used for partial depth repair under 2 in (50 mm) thick and can be extended with gravel for full depth repairs. Rapid Road Repair® - Extended is pre-blended with gravel for full depth repairs.

PRODUCT USE

QUIKRETE® Rapid Road Repair® and QUIKRETE® Rapid Road Repair® - Extended are a fast-setting, rapid-hardening products designed to repair concrete highways, bridge decks, concrete parking lots and concrete floors. In most cases, traffic can be resumed in less than 1 hour after patching. Rapid Road Repair can be used to replace sections of streets or highways, runways or taxiways of airports and other applications where quick return to usage is desired.

SIZES

- 50 lb (22.7 kg) bags
- 67 lb (30.4 kg) bag
- 80 lb (36.3 kg) bags (in Extended version)

YIELD

- A 50 lb (22.7 kg) bag of QUIKRETE® Rapid Road Repair® will yield 0.40 cu ft (11 L) of material.
- A 67 lb (30.4 kg) bag will yield 0.54 cu ft (15 L).
- A 80 lb (36.3 kg) bag of QUIKRETE® Rapid Road Repair® - Extended will yield .64 cu ft (17.0 L)

LIMITATIONS

During extremely hot or dry conditions, cold water should be used to maintain mix at a moderate placement temperature.

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International

- ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C78 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- ASTM C157/C157M Standard Test Method for Length Change of Hardened Hydraulic- Cement, Mortar, and Concrete
- ASTM C191 Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
- ASTM C531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
- ASTM C642 Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
- ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- ASTM C672/C672M Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- ASTM C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear
- ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs

PHYSICAL/CHEMICAL PROPERTIES

QUIKRETE® Rapid Road Repair®, when tested in accordance with ASTM procedures, provides results as listed in Table 1.

QUIKRETE® Rapid Road Repair® meets the requirements of ASTM C928/928M Grade R3. It can be modified to meet specific requirements of the Department of Transportation in various states.

TABLE 1 – PHYSICAL/CHEMICAL	
Property & test	**Typical values**
Setting ASTM C191	
Initial	17 - 25 minutes
Final	25 - 45 minutes
Flexural strength, ASTM C78	
4 hr	550 psi (3.8 MPa)
1 day	900 psi (6.2 MPa)
7 days	950 psi (6.6 MPa)
28 days	1,000 psi (6.9 MPa)
Compressive strength, ASTM C109	
1 hr	3,000 psi (20.7 MPa)
3 hrs	3,400 psi (23.4 MPa)
24 hrs	5,200 psi (35.9 MPa)
7 days	8,100 psi (55.9 MPa)
28 days	8,370 psi (57.7 MPa)
Bond strength, ASTM C882	
1 day	2,000 psi (13.8 MPa)
7 days	2,500 psi (17.3 MPa)
Absorption, ASTM C642	5.1%
Length change, ASTM C157	
In water	+0.04%
In air	-0.04%
Coefficient of thermal expansion, ASTM C531	4×10^{6} - 9×10^{6}
Freeze/thaw, ASTM C666	96%
Scaling resistance, ASTM C672	Excellent

INSTALLATION

SURFACE PREPARATION

- Remove all spalled areas and areas of unsound concrete and patching
- The hole should have a vertical edge of 1/2" (12.7 mm) or more, formed by use of a pneumatic jackhammer or sawing. Holes should be chipped out to create a new, sound substrate
- After the chipping process is completed, the repair area must be cleaned by water blasting or other suitable method
- Dampen holes with clean water before patching. No puddles of water should be left in the hole

MIXING

- Use 3/4 gal (2.8 L) of water per 50 lb (22.7) bag
  Use 1 gal (3.8 L) of water per 67 lb (30.4 kg) bag
  Use 3/4 gal (2.8 L) of water per 80 lb (36.3 kg) bag of Rapid Road Repair - Extended
- All tools and equipment used in the mixing and finishing process should be clean
- Place clean water in mixer. While mixer is running, add contents of bag
- Mix 4 to 5 minutes. The mix will appear stiffer than normal concrete
- Place in a wheelbarrow or other transporting vehicle. Place the mixture immediately after the mixing is completed

Note - Working time is 10 - 20 minutes and will fluctuate: shorter time during severe hot weather and longer time during cold weather.

PLACING

- The hole should be filled by placing material full depth, from one end to the other to eliminate part depth lifts between batches
- Consolidate the material in the hole by hand tamping or chopping with a shovel. This is particularly important around the edges
- Screed and finish patches with hand tools to create a surface finish equivalent to the existing slab finish

CURING

No curing membranes or compounds are required. Traffic can be allowed over the patch in approximately 1 hour if the temperature is 70 degrees F (21 degrees C) or above. Cure under ambient conditions. Do not moist cure.

AGGREGATE EXTENSION

For deep patches, QUIKRETE® Rapid Road Repair® – Extended may be used or QUIKRETE® Rapid Road Repair® may be extended with up to 25 lb (11.3 kg) of minus 1/2" (12.7 mm) coarse aggregate per 50 lb (22.7 kg) bag or 33 lb (15 kg) per 67 lb (30.4 kg) bag. Water content must be adjusted depending on the moisture content of the aggregate. Adjust as needed to achieve a slump of about 3" - 4" (76 - 102 mm). Typical test results are found in Table 2.

TABLE 2 - QUIKRETE® RAPID ROAD REPAIR - EXTENDED[1]	
Set Time, C191	Final 20-40 minutes
Slump, C143	3-5" (76-127 mm)
Property & test	**Typical value**
Compressive strength, ASTM C39	
90 min	2,000 psi (13.8 MPa)
3 hr	2,750 psi (19.0 MPa)
24 hr	6,150 psi (42.2 MPa)

[1] Product extended with 50% by weight minus 1/2" (12.7 mm) diameter coarse aggregate.

PRECAUTIONS

QUIKRETE® Rapid Road Repair® must be properly placed in a space surrounded by sound, high quality previously hardened concrete. Do not subject to de-icing salts for at least 7 days after placement.

AVAILABILITY

QUIKRETE® Rapid Road Repair® and QUIKRETE® Rapid Road Repair® - Extended are available at leading concrete construction supply houses and distributors. Contact QUIKRETE® Construction Products representative for the name of the nearest dealer.

WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

MAINTENANCE

None required.

TECHNICAL SERVICES

The QUIKRETE® Companies maintain technical field representatives throughout the country. Contact a local distributor for the name and number of the nearest representative, or call QUIKRETE® Construction Products.

The QUIKRETE Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300
Atlanta, GA 30305
(404) 634-9100
Fax: (404) 842-1425

** Refer to www.quikrete.com for the most current technical data, MSDS, and guide specifications*

RAPID ROAD REPAIR & RAPID ROAD REPAIR-EXTENDED

PRODUCT No. 1242

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Freeze/thaw, ASTM C666	96%
Scaling resistance, ASTM C672	Excellent

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MIXING

- Use 3/4 gal (2.8 L) of water per 50 lb (22.7) bag
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Note - Working time is 10 - 20 minutes and will fluctuate: shorter time during severe hot weather and longer time during cold weather.

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AGGREGATE EXTENSION

For deep patches, QUIKRETE® Rapid Road Repair® – Extended may be used or QUIKRETE® Rapid Road Repair® may be extended with up to 25 lb (11.3 kg) of minus 1/2" (12.7 mm) coarse aggregate per 50 lb (22.7 kg) bag or 33 lb (15 kg) per 67 lb (30.4 kg) bag. Water content must be adjusted depending on the moisture content of the aggregate. Adjust as needed to achieve a slump of about 3" - 4" (76 - 102 mm). Typical test results are found in Table 2.

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[1] Product extended with 50% by weight minus 1/2" (12.7 mm) diameter coarse aggregate.

PRECAUTIONS

QUIKRETE® Rapid Road Repair® must be properly placed in a space surrounded by sound, high quality previously hardened concrete. Do not subject to de-icing salts for at least 7 days after placement.

AVAILABILITY

QUIKRETE® Rapid Road Repair® and QUIKRETE® Rapid Road Repair® - Extended are available at leading concrete construction supply houses and distributors. Contact QUIKRETE® Construction Products representative for the name of the nearest dealer.

WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

MAINTENANCE

None required.

TECHNICAL SERVICES

The QUIKRETE® Companies maintain technical field representatives throughout the country. Contact a local distributor for the name and number of the nearest representative, or call QUIKRETE® Construction Products.

The QUIKRETE Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300
Atlanta, GA 30305
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Fax: (404) 842-1425

** Refer to www.quikrete.com for the most current technical data, MSDS, and guide specifications*

533.1 DESCRIPTION

This Work consists of the following:

1. Removal of loose, unsound, and deteriorated concrete;
2. Removal and replacement of corroded reinforcing bars;
3. Furnishing, placing, finishing, and curing concrete repair Materials;
4. Applying penetrating water repellent treatment and a special surface finish over exposed surfaces; and
5. Other operations necessary to restore concrete and to satisfactorily complete the concrete work.

533.2 MATERIALS

533.2.1 Concrete

Use a pre-packaged, pre-blended; concrete that is combined with water at the site.

Select repair Material from the Department's *Approved Products List*.

533.2.1.1 Product Data Sheets

Submit manufacturer's product data sheets at least 15 Days before the start of concrete repair work that describe the product's intended for use in Structure repair to the Project Manager. Include mixing, application, and curing instructions.

533.2.2 Enriched Mortar

Provide enriched mortar that consists of a blended patching Material and water. Provide enriched mortar with physical properties in accordance with Table 533.2.2:1, "Enriched Mortar Physical Property Requirements."

Table 533.2.2:1
Enriched Mortar Physical Property Requirements

Property	ASTM Test	Requirements
Compressive strength, minimum	C-109	1 Day: 2,500 psi 7 Days: 3,000 psi 28 Days: 4,000 psi
Bond strength, minimum	C-882	1 Day: 2,500 psi 7 Days: 3,000 psi 28 Days: 4,000 psi
Linear length change, maximum	C-157	28 Days wet: +0.05 %[a] 28 Days dry: -0.05 %
Coefficient of thermal expansion (in/in/°F)	C-531	3.9×10^{-6} to 7.1×10^{-6}
Freeze/thaw resistance @ 300 cycles, minimum	C-666	85% durability

[a]The maximum allowable expansion is 0.4% if the locations where enriched mortar is used can tolerate such expansions without exceeding the elastic limit.

533.2.3 Enriched Concrete

Provide enriched concrete consisting of enriched mortar extended with recommended amounts of coarse aggregate. Provide enriched concrete with physical properties in accordance with Table 533.2.3:1, "Enriched Concrete Physical Property Requirements."

Table 533.2.3:1
Enriched Concrete Physical Property Requirements

Property	ASTM Test	Requirements
Compressive strength, minimum	C-39	1 Day: 2,300 psi 7 Days: 2,800 psi 28 Days: 3,500 psi
Bond strength, minimum	C-882	1 Day: 900 psi 7 Days: 1,800 psi 28 Days: 2,200 psi
Linear length change (%), maximum	C-157	28 Days wet: +0.04 %[a] 28 Days dry: -0.04 %
Coefficient of thermal expansion (in/in/°F)	C-531	3.9×10^{-6} to 7.1×10^{-6}
Freeze/thaw resistance @ 300 cycles, minimum	C-666	85% durability

[a]The maximum allowable expansion can be 0.4% as long as the locations where enriched concrete is used can tolerate such expansions without exceeding the elastic limit.

533.2.4 Aggregates

Unless otherwise directed by the manufacturer of the preblended patching Material or bonding agent, use fine aggregates in accordance with Section 509.2.4.3, "Fine Aggregate," and coarse aggregate in accordance with Table 533.2.4:1, "Coarse Aggregate Gradations."

Table 533.2.4:1
Coarse Aggregate Gradations

	% passing	
Sieve size	Minimum	Maximum
3/4 in	100	—
1/2 in	90	100
3/8 in	40	70
No. 4	0	15

533.2.5 Water

Provide water in accordance with Section 509.2.6, "Water."

533.2.6 Test Cylinders

At least 30 Days before the start of concrete Structure repair, prepare at least three 4 in × 8 in concrete cylinders for testing in the presence of Department personnel and submit to the Project Manager. Prepare cylinder concrete with the same Materials mixed in the same proportions as the concrete proposed for the Work. Use the proposed Equipment to prepare the cylinder concrete. Use the maximum recommended water ratio. The Department will use the cylinders to determine if the repair Material meets the 7-Day and 28-Day compressive strength requirements.

533.3 CONSTRUCTION REQUIREMENTS

533.3.1 Preparation of Repair Areas

The Contract will specify approximate repair areas. The Project Manager will locate and mark the areas with 3/4 in-deep sawcuts

Remove unsound material within the repair limits using chipping hammers or other approved hand-operated devices.

533.3.1.1 Concrete Removal

Saw cut all boundaries to 0.75 in depth, remove concrete with pavement breakers and chipping hammers. Use hand tools only for final removal of concrete from reinforcing bars and faces of remaining concrete. Use Department-approved removal Equipment.

The following restrictions apply to concrete removal tools:

1. Do not use pavement breakers heavier than the 30 lb class;
2. Do not use chipping hammers heavier than the 15 lb class;
3. Operate pavement breakers or mechanical chipping tools only at a 90° angle;
4. Use only hand-powered tools such as hammers and chisels to remove the final concrete particles from reinforcing bars.

533.3.1.2 Concrete Surface Preparation and Cleaning

Ensure the surface substrate is clean, sound, and dry. Remove substances that may prevent a bond between existing and new concrete. If using acid etchers, concrete cleaners, or degreasers to clean the existing surface, remove completely after cleaning.

Mechanically roughen the existing surface using Equipment such as chipping hammers. Remove loose and excess material from repair areas. Place a 4-inch piece of duct tape every square yard to test for cleanliness. The Department will not allow more than 25% of the tape surface to show dust coverage.

Before placing mortar or concrete, clean repair areas with oil-free compressed air or pressurized water. Moisten the substrate and remove excess water.

533.3.1.3 Preparation of Exposed Reinforcing Bars

Preserve existing reinforcing steel exposed during concrete removal. If the bond between exposed bars and adjacent concrete breaks, chip at least 3/4 in deep into the adjacent concrete around the entire bar.

Sandblast exposed reinforcing steel before placing new mortar or concrete.

Strengthen corroded or damaged existing bars by splicing an equal sized bar at least 2 ft longer than the corroded or damaged length. The minimum splice length shall be 1 ft on each end.

533.3.1.4 Application of Bonding Agents

Use diluted bonding admixture or other manufacturer-recommended priming systems as bonding agents. Apply the bonding agents to the contact surfaces of the repair areas immediately before concrete or mortar placement.

533.3.2 Depth of Repair

Use enriched mortar where the repair depth is less than 1 in, and use enriched concrete where the repair depth is 1 in or greater. If the repair depth is 4 in or greater, use the appropriate class concrete.

533.3.3 Placing, Finishing, and Curing

Do not mix mortar and concrete in repair areas. Use forms if necessary.

533.3.3.1 Temperature and Weather Limitations

Make repairs when the air temperature is between 50 °F and 95 °F. Maintain the temperature of the mortar and concrete at or above 50 °F during the curing period. Use a set retardant if recommended by the manufacturer.

533.3.3.2 Placement

Place mortar or concrete in a continuous operation for each repair area. For vertical surfaces, start the Work at the bottom of the patch and continue upwards, and from one edge to the other to prevent the entrapment of air pockets.

If the repair area abuts or crosses a working joint, place a temporary strip of waxed wood or pre-molded filler in the joint before placing repair Material. Remove the strips before the concrete sets.

The Contractor may also repair areas that occur on both sides of a joint by patching the entire cavity and restoring the joint by saw cutting immediately after the repair Material has set, instead of using a temporary vertical insert strip.

533.3.3.3 Curing

Cure in accordance with the manufacturer's recommendations. If the manufacturer does not specify a cure method, use Method 2 or Method 4 in accordance with Section 511.3.9, "Curing."

533.3.4 Inspection

The Project Manager will examine repaired areas after the curing period is completed to ensure soundness of the repairs and complete bonding with the existing members. Remove and replace unacceptable areas at no additional cost to the Department.

533.3.5 Penetrating Water Repellent Treatment

If the Contract requires a penetrating water repellent treatment, apply in accordance with Section 511.3.8.6, "Penetrating Water Repellent Treatment Solution," and Section 532, "Penetrating Water Repellent Treatment."

533.3.6 Special Surface Finish

Finish exposed surfaces of piers, abutments, edges of decks and barrier railings, and other locations to a Class 4 finish in accordance with Section 511.3.8.5, "Class 4, Special Surface Finish," after repairs and curing are complete.

533.3.7 Final Operations

Clean, remove, and dispose of debris resulting from the concrete repair work as approved by the Project Manager.

533.4 METHOD OF MEASUREMENT

If the repair depth does not exceed 4 in, the Department will measure the Work by the square yard. If the repair depth exceeds 4 in, the Department will negotiate a unit price with the Contractor. The Department will measure exposed surfaces before the application of the special surface finish.

533.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Repair of Concrete Structures	Square Yard

533.5.1 Work Included in Payment

The following work and items will be considered as included in the payment for the main items and will not be measured or paid for separately: sampling and submittals, saw cutting operations' and removal of debris.