



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 330-2011**

**SUPPLY AND DELIVERY OF PARTIAL DEPTH PAVEMENT REPAIR MATERIAL**

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## **PART B - BIDDING PROCEDURES**

### **B1. CONTRACT TITLE**

B1.1 SUPPLY AND DELIVERY OF PARTIAL DEPTH PAVEMENT REPAIR MATERIAL

### **B2. SUBMISSION DEADLINE**

B2.1 The Submission Deadline is 4:00 p.m. Winnipeg time, May 12, 2011.

B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

### **B3. ENQUIRIES**

B3.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

B3.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall promptly notify the Contract Administrator of the error, discrepancy or omission at least five (5) Business Days prior to the Submission Deadline.

B3.3 If the Bidder is unsure of the meaning or intent of any provision therein, the Bidder should request clarification as to the meaning or intent prior to the Submission Deadline.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B3.5 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B3.6 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

### **B4. ADDENDA**

B4.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

B4.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B4.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>

B4.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B4.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 7 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

## **B5. SUBSTITUTES**

- B5.1 The Work is based on the materials, equipment, methods and products specified in the Bid Opportunity.
- B5.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B5.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least seven (7) Business Days prior to the Submission Deadline.
- B5.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the material, equipment, method or product as either an approved equal or alternative;
  - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
  - (c) identify any anticipated cost or time savings that may be associated with the substitute;
  - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the Contract;
  - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the Contract.
- B5.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B5.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.
- B5.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.
- B5.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B5.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B13.
- B5.9 No later claim by the Contractor for an addition to the price(s) because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.
- B5.10 Notwithstanding B5.2 to B5.9, and in accordance with B6.7, deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B13.1(a).

## **B6. BID SUBMISSION**

- B6.1 The Bid shall consist of the following components:

- (a) Form A: Bid;
  - (b) Form B: Prices.
- B6.2 Further to B6.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B5.
- B6.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely in ink, to constitute a responsive Bid.
- B6.4 The Bid Submission may be submitted by mail, courier or personal delivery, or by facsimile transmission.
- B6.5 If the Bid Submission is submitted by mail, courier or personal delivery, it shall be enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address, and shall be submitted to:
- The City of Winnipeg  
Corporate Finance Department  
Materials Management Division  
185 King Street, Main Floor  
Winnipeg MB R3B 1J1
- B6.5.1 Samples or other components of the Bid Submission which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid Submission.
- B6.6 Bidders are advised not to include any information/literature except as requested in accordance with B6.1.
- B6.7 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B13.1(a).
- B6.8 If the Bid Submission is submitted by facsimile transmission, it shall be submitted to (204) 949-1178.
- B6.8.1 The Bidder is advised that the City cannot take responsibility for the availability of the facsimile machine at any time.
- B6.9 Bids submitted by internet electronic mail (e-mail) will not be accepted.
- B7. BID**
- B7.1 The Bidder shall complete Form A: Bid, making all required entries.
- B7.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
  - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
  - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
  - (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B7.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B7.2.
- B7.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

- B7.4 Paragraph 9 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;
  - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
  - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;
  - (d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B7.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B7.4.2 All signatures shall be original.

B7.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

## **B8. PRICES**

B8.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B8.1.1 Prices on Form B: Prices shall include:

- (a) duty;
- (b) freight and cartage;
- (c) Provincial and Federal taxes [except the Goods and Services Tax (GST) and Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable] and all charges governmental or otherwise paid;
- (d) Profit and all compensation which shall be due to the Contractor for the Work and all risks and contingencies connected therewith.

B8.1.2 Prices on Form B: Prices shall not include the Manitoba Association for Resource Recovery Corporation (MARRC) Environmental Handling Charge (EHC) which shall be extra where applicable.

B8.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B8.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

## **B9. QUALIFICATION**

B9.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Bidder does not carry on business in Manitoba, in the jurisdiction where the Bidder does carry on business; and
- (b) be financially capable of carrying out the terms of the Contract; and
- (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.

- B9.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>
- B9.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
  - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
  - (c) have a written workplace safety and health program, if required, pursuant to The Workplace Safety and Health Act (Manitoba);
- B9.4 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B9.5 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

## **B10. OPENING OF BIDS AND RELEASE OF INFORMATION**

- B10.1 Bids will not be opened publicly.
- B10.2 Following the Submission Deadline, the names of the Bidders and their bid prices (unevaluated, and pending review and verification of conformance with requirements or evaluated prices) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>
- B10.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>
- B10.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

## **B11. IRREVOCABLE BID**

- B11.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 8 of Form A: Bid.
- B11.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work for the time period specified in Paragraph 8 of Form A: Bid.

## **B12. WITHDRAWAL OF BIDS**

- B12.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B12.1.1 Notwithstanding C21, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

- B12.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 9 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B12.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
  - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 9 of Form A: Bid; and
  - (c) if the notice has been given by any one of the persons specified in B12.1.3(b), declare the Bid withdrawn.
- B12.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B11.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law.

### **B13. EVALUATION OF BIDS**

- B13.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation therefrom (pass/fail);
  - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9 (pass/fail);
  - (c) Total Bid Price;
  - (d) economic analysis of any approved alternative pursuant to B5;
- B13.2 Further to B13.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities if the interests of the City so require.
- B13.3 Further to B13.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.
- B13.4 Further to B13.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.
- B13.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.
- B13.4.2 Further to B13.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.
- B13.5 This Contract will be awarded as a whole.

### **B14. AWARD OF CONTRACT**

- B14.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B14.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.



- B14.2.1 Without limiting the generality of B14.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
  - (b) the prices are materially in excess of the prices received for similar work in the past;
  - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
  - (d) only one Bid is received; or
  - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B14.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B13.
- B14.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.
- B14.4 Notwithstanding C4 and Paragraph 5 of Form A: Bid, the City will issue a Purchase Order to the successful Bidder in lieu of the execution of a Contract.
- B14.5 The Contract Documents, as defined in C1.1(n)(ii) in their entirety shall be deemed to be incorporated in and to form a part of the Purchase Order notwithstanding that they are not necessarily attached to or accompany said Purchase Order.

## **PART C - GENERAL CONDITIONS**

### **C0. GENERAL CONDITIONS**

- C0.1 The *General Conditions for the Supply of Goods* (Revision 2008 05 26) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for the Supply of Goods* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at [http://www.winnipeg.ca/matmgt/gen\\_cond.stm](http://www.winnipeg.ca/matmgt/gen_cond.stm)
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Supply of Goods*.

## **PART D - SUPPLEMENTAL CONDITIONS**

### **GENERAL**

#### **D1. GENERAL CONDITIONS**

D1.1 In addition to the *General Conditions for the Supply of Goods*, these Supplemental Conditions are applicable to the Work of the Contract.

#### **D2. SCOPE OF WORK**

D2.1 The Work to be done under the Contract shall consist of the supply and delivery of Partial Depth Pavement Repair Material for the period from the award of contract to October 31, 2011.

#### **D3. CONTRACT ADMINISTRATOR**

D3.1 The Contract Administrator is:

Jim Berezowsky  
Support Services Supervisor  
104-1155 Pacific Avenue  
Winnipeg, MB R3E 3P1  
Telephone No.: (204) 986-5076  
Facsimile No.: (204) 986-5566

#### **D4. NOTICES**

D4.1 Notwithstanding C21.3, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg  
Chief Financial Officer  
Facsimile No.: (204) 949-1174

### **SUBMISSIONS**

#### **D5. AUTHORITY TO CARRY ON BUSINESS**

D5.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

### **SCHEDULE OF WORK**

#### **D6. COMMENCEMENT**

D6.1 The Contractor shall not commence any Work until he is in receipt of a notice of award from the City authorizing the commencement of the Work.

D6.2 The Contractor shall not commence any Work until:

- (a) the Contract Administrator has confirmed receipt and approval of:
  - (i) evidence of authority to carry on business specified in D5;
  - (ii) evidence of the workers compensation coverage specified in C6.16;

- (b) the Contractor has attended a meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a meeting.

## **D7. DELIVERY**

- D7.1 Goods shall be delivered within fourteen (14) Calendar Day(s) of the award of contract, f.o.b. destination, freight prepaid to:

Public Works Stores  
1277 Pacific Avenue

Winnipeg, MB R3E 1G7The Contractor shall confirm each delivery with the Contract Administrator or his/her designate, at least two (2) Business Days before delivery.

- D7.3 Goods shall be delivered between 8:30 a.m. and 4:30 p.m. on Business Days.
- D7.4 Goods shall be delivered on a flat bed truck to accommodate side unloading with a forklift.
- D7.5 The City will place a minimum order of three hundred and thirty-six bags (336) bags each weighing fifty (50) lbs or (22.68 kg) on six (6) pallets.

## **D8. LIQUIDATED DAMAGES**

- D8.1 If the Contractor fails to achieve delivery of the goods within the time specified in D7.1 Delivery the Contractor shall pay the City Three Hundred dollars (\$300.00) per Calendar Day for each and every Calendar Day until the goods have been delivered.
- D8.2 The amount specified for liquidated damages in D8.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Delivery by the day fixed herein for same.
- D8.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

## **D9. PALLET**

- D9.1 The Contractor shall include, **if applicable**, pallet charges on Form B: Prices, if this item is not completed it will be understood that no charges shall apply.
- D9.2 The Contractor shall pay all transportation charges both ways on all items in accordance with D7. The items will be used by the City of Winnipeg when the pallets are emptied, the Contract Administrator will inform the Contractor's for the return instruction.
  - D9.2.1 The estimated annual quantity for Item No. 2 is based on the number of pallets and the length of time in the City's possession.
  - D9.2.2 Pallets being returned to the Contractor shall be picked up by the Contractor within one (1) Business Day of notification by the User, except where otherwise agreed at the time of notification. No payment shall be made for additional time in the City's possession as a result of a delay in pick-up allowed for the convenience of the Contractor.
- D9.3 All goods being supplied shall be packed by the Contractor to obtain the least amount of damage while in transit without sacrificing adequate protection of goods.

## **D10. PAYMENT**

- D10.1 Further to C10, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

## **WARRANTY**

### **D11. WARRANTY**

D11.1 Warranty is as stated in C11.

## PART E - SPECIFICATIONS

### GENERAL

#### E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B5.

#### E2. GOODS

- E2.1 The Contractor shall supply and deliver Five Star Highway Patch or Euclid Versaspeed Rapid Setting Repair Mortar in accordance with the requirements hereinafter specified.
- E2.2 Item No. 1 – shall be Five Star Highway Patch or Euclid Versaspeed Rapid Setting Repair Mortar meeting the following requirements:
- E2.2.1 Product shall be a one component pre-blended, fast setting hydraulic cement material requiring only the addition of potable water and be designed for horizontal repairs of concrete pavement.
- E2.2.2 Product shall provide resistance to oil, grease, gasoline, salts, and other chemicals found in the transportation environment.
- E2.2.3 Product shall be packaged and supplied in heavy-duty polyethylene lined bags each weighing 50 lbs.
- E2.2.4 Product shall be capable of being extended 50% by weight with local coarse aggregate.
- E2.2.5 Typical properties of Five Star Highway Patch at 70°F (21°C) shall be:

<b>Compressive Strength, ASTM C 109</b>	
2 Hours	2000 psi (13.8 MPa)
3 Hours	3500 psi (24.1 MPa)
1 Day	5000 psi (34.5 MPa)
7 Days	7000 psi (48.3 MPa)
<b>Bond Strength, ASTM C 882</b>	
1 Day	1500 psi (10.4 MPa)
7 Days	2000 psi (13.8 MPa)
<b>Length Change, ASTM C 157</b>	
28 Days Wet	+0.05%
28 Days Dry	-0.05%
<b>Freeze/Thaw Resistance, ASTM 666A</b>	
Relative Durability Factor	90%
<b>Flexural Strength, ASTM C 78</b>	
3 Hours	400 psi
<b>Chloride Ion Permeability, ASTM C 1202</b>	
28 Days	Very Low (<1000 Coulombs)
<b>Working Time at 70°F (21°C)</b>	10 minutes

E2.2.6 Typical properties of Euclid Versaspeed Rapid Setting Repair Mortar at 70°F (21°C) shall be:

<b>Compressive Strength ASTM C 109, 2" (50 mm) cubes</b>	
@ 0.44 gal/50 lb bag.	
<b>Age Strength</b>	
3 hours.....	3,500 psi (24.1 MPa)
1 day.....	5,500 psi (37.9 MPa)
7 days.....	8,500 psi (58.6 MPa)
28 days.....	10,000 psi (68.9 MPa)
<b>Flexural Strength ASTM C 348</b>	
1 day.....	900 psi (6.2 MPa)
7 days.....	1,000 psi (6.9 MPa)
28 days.....	1,250 psi (8.6 MPa)
<b>Slant ShearBond ASTM C 882</b>	
1 day.....	>2,550 psi (17.6 MPa)
7 days.....	>3,000 psi (20.7 MPa)
28 days.....	>3,150 psi (21.7 MPa)
<b>Linear Shrinkage ASTM C 157</b>	
50% R. H. @ 730F (230C)	
1 day.....	-0.064%
7 days.....	-0.077%
14 days.....	-0.078%
28 days.....	-0.083%
<b>Chloride Permeability ASTM C 1202</b>	
28 days.....	900 coulombs (very low)
Freeze/Thaw Resistance ASTM C 666 Procedure A	
300 Cycles.....	100.8% relative dynamic modulus
<b>Set Time ASTM C 403 @ 72°F (22°C)</b>	
Initial Set.....	15 to 30 min
Final Set.....	20 to 40 min
Unit Weight.....	144 lb/ft <sup>3</sup> (2245 kg/m <sup>3</sup> )