

**Foundation for Innovation and Technology Transfer (FITT)**

**REF: FT/2024/05/02**  
**Date: September 27<sup>th</sup>, 2024**

**Notice Inviting Quotation**

**Technical Specifications for Field-scale Corrosion Repair of Structural Members of a Building**

This tender call invites interested parties for four types of repairs on the reinforced concrete (RC) elements of a building complex. The specifications for each type of repair are highlighted in the following tables along with the quantity.

<b>Repair type 1: Basic repair of the RC elements</b> [up to <b>5 in Nos.</b> , and located at the stilt level]			
<b>Item</b>	<b>Description of repair type 1 on each RC element</b>	<b>Unit</b>	<b>Quantity</b>
<b>1</b>	Providing temporary high steel barricades with warning signs along the site's perimeter, including installation and removal.	Smt.	
<b>2</b>	Erecting MS props and H frames with cross bracings and jacks up to support the distressed structure during repairs.	Nos.	
<b>3</b>	Erecting self-supported two-legged B class tubular steel scaffolding with platforms and ladders for external façade work, including dismantling and site clearance after completion.	Sqm.	
<b>4</b>	Erecting dust/green net along the periphery to control debris spread during construction.	Sqm.	
<b>5</b>	Shifting debris from concrete breaking, flooring, and plaster to ground level and disposal.	Cum.	
<b>6.a</b>	Identifying loose concrete by light hammer tapping, mark areas with paint, and groove cutting of the perimeter to make perfect wedge shapes up to 25 mm depth.	Rmt.	
<b>6.b</b>	Removing existing concrete using low-impact high-frequency hammer or manual chipping, cleaning the surface with an air jet to the required depth or until unsound concrete is reached.	Sqm.	
<b>7</b>	Cleaning existing reinforcement with a wire brush, apply rust remover, and minimum two coats of Zinc Rich Primer.	Sqm.	
<b>8</b>	Providing additional Fe-500 grade steel reinforcement (or as found ex-situ) conforming to IS 1786 to compensate for corrosion loss, and fixing of rebars is to be with binding wires with existing steel at regular grid. (Make - JSW, Tata, SAIL, Vizag, etc.).	Nos.	

<b>9</b>	Installation of shear key connector: Drilling straight or inclined holes up to 100 mm deep and 20 mm in diameter in concrete using an electrically operated drilling machine. This includes fixing 12 mm diameter shear key connectors in the concrete using a high-performance epoxy resin-based bonding agent. The bonding agent must comply with EN 1992-4 standards and provide a strong bond, enhanced load transfer, and resistance to environmental factors.	Nos.	
<b>10</b>	Drilling of holes, removal of dust, mixing of resin and hardener, and anchoring of rebars (as observed ex-situ) in existing concrete using polyester resin-based anchoring grout, ensuring rebar depth is 10 times the diameter of the drilling; where the diameter of bar is up to 16 mm and necessary rebaring of reinforcement steel with 10 times dia depth of drilling. (Make - JSW, Tata, SAIL, Vizag, etc.)	Kg	
<b>11</b>	Drilling of 12 mm dia. Holes up to 50-75 mm depth at intervals of 350 mm in the RC members, and to be cleaned with an air blower for installation of 12 mm Teflon nozzles (up to resistance of 5 kg/cm <sup>2</sup> ) with epoxy putty; to be followed by curing and nozzle cutting post-grouting without damaging the structure.	Nos.	
<b>12</b>	Grouting with a low-viscosity epoxy resin thermoset through nozzles using a pressure injector and accessories until refusal by the nozzle. To be included with mixing of materials in required quantities and as per manufacturer's instructions. For grouting, the grouting gun pressure shall be maintained at 3-4 kg/cm <sup>2</sup> pressure. Sealing of nozzles with epoxy putty and monitoring for leaks.	Kg	
<b>13</b>	Applying structural grade epoxy bond coat by brush to ensure adhesion between old and new concrete surfaces; it will be measured per sq.m of application.	Sqm.	
<b>14</b>	Replacement of carbonated and damaged concrete by installing slurry-tight formwork, pouring fluid micro concrete repair material, including centering, shuttering, and formwork removal, for repairs exceeding 30 mm depth, 40-60 mm thickness, density 1440 kg/m <sup>3</sup> .		
<b>15</b>	Micro-concreting (M-40) the column up to the level where the loose concrete was removed.	Kg	
<b>16</b>	Repairing of structural profiles using modified mortar system up to 15-20 mm thickness, including leveling and profiling.	Sqm.	
<b>17</b>	Electrochemical tests, such as half-cell potential mapping and linear polarization resistance (LPR), shall be conducted on RC elements before and after repair to assess the initial corrosion state and evaluate the effectiveness and long-term performance of the repair.	Nos	

**Repair type 2: Basic repair of the RC elements with sacrificial Galvanic Anode of type 1 [up to 7 in Nos., and located at the stilt level]**

<b>Item</b>	<b>Description of repair type 2 on each RC element</b>	<b>Unit</b>	<b>Quantity</b>
<b>1</b>	Providing temporary high steel barricades with warning signs along the site's perimeter, including installation and removal.	Smt.	
<b>2</b>	Erecting MS props and H frames with cross bracings and jacks up to support the distressed structure during repairs.	Nos.	
<b>3</b>	Erecting self-supported two-legged B class tubular steel scaffolding with platforms and ladders for external façade work, including dismantling and site clearance after completion.	Sqm.	
<b>4</b>	Erecting dust/green net along the periphery to control debris spread during construction.	Sqm.	
<b>5</b>	Shifting debris from concrete breaking, flooring, and plaster to ground level and disposal.	Cum.	
<b>6.a</b>	Identifying loose concrete by light hammer tapping, mark areas with paint, and groove cutting of the perimeter to make perfect wedge shapes up to 25 mm depth.	Rmt.	
<b>6.b</b>	Removing existing concrete using low-impact high-frequency hammer or manual chipping, cleaning the surface with an air jet to the required depth or until unsound concrete is reached.	Sqm.	
<b>7</b>	Cleaning existing reinforcement with a wire brush, apply rust remover, and minimum two coats of Zinc Rich Primer.	Sqm.	
<b>8</b>	Providing additional Fe-500 grade steel reinforcement (or as found ex-situ) conforming to IS 1786 to compensate for corrosion loss, and fixing of rebars is to be with binding wires with existing steel at regular grid. (Make - JSW, Tata, SAIL, Vizag, etc.).	Nos.	
<b>9</b>	Installation of shear key connectors: Drilling straight or inclined holes up to 100 mm deep and 20 mm in diameter in concrete using an electrically operated drilling machine. This includes fixing 12 mm diameter shear key connectors in the concrete using a high-performance epoxy resin-based bonding agent. The bonding agent must comply with EN 1992-4 standards and provide a strong bond, enhanced load transfer, and resistance to environmental factors.	Nos.	
<b>10</b>	Drilling of holes, removal of dust, mixing of resin and hardener, and anchoring of rebars (as observed ex-situ) in existing concrete using polyester resin-based anchoring grout, ensuring rebar depth is 10 times the diameter of the drilling; where the diameter of bar is up to 16 mm and necessary rebaring of reinforcement steel with 10 times dia depth of drilling. (Make - JSW, Tata, SAIL, Vizag, etc.)	Kg	

11	<p>Installation of non-circular embedded galvanic anode units utilizing zinc, in compliance with ASTM B418-95a Type I with zinc mass ranging around <math>60 \pm 5</math> gm, cast around integral tie wires made of non-corrosive material for attachment to reinforcing steel. The anodes to be encased in a cementitious mortar with a pH of 14 or greater. The spacing of the anodes shall follow the manufacturer's recommendations along the exposed steel area.</p> <p>The installation process includes removing loose concrete, thoroughly cleaning the corroded steel, soaking the anodes in water for 20-30 minutes (or as specified by the manufacturer), and securely fastening them to the rebar using tie wires.</p>		
12	Drilling of 12 mm dia. Holes up to 50-75 mm depth at intervals of 350 mm in the RC members, and to be cleaned with an air blower for installation of 12 mm Teflon nozzles (up to resistance of $5 \text{ kg/cm}^2$ ) with epoxy putty; to be followed by curing and nozzle cutting post-grouting without damaging the structure.	Nos.	
13	Grouting with a low-viscosity epoxy resin thermoset through nozzles using a pressure injector and accessories until refusal by the nozzle. To be included with mixing of materials in required quantities and as per manufacturer's instructions. For grouting, the grouting gun pressure shall be maintained at $3-4 \text{ kg/cm}^2$ pressure. Sealing of nozzles with epoxy putty and monitoring for leaks.	Kg	
14	Applying structural grade epoxy bond coat by brush to ensure adhesion between old and new concrete surfaces; it will be measured per sq.m of application.	Sqm.	
15	Replacement of carbonated and damaged concrete by installing slurry-tight formwork, pouring fluid micro concrete repair material, including centering, shuttering, and formwork removal, for repairs exceeding 30 mm depth, 40-60 mm thickness, density $1440 \text{ kg/m}^3$ .		
16	Micro-concreting (M-40) the column up to the level where the loose concrete was removed.	Kg	
17	Repairing of structural profiles using modified mortar system up to 15-20 mm thickness, including leveling and profiling.	Sqm.	
18	Electrochemical tests, such as half-cell potential mapping and linear polarization resistance (LPR), shall be conducted on RC elements before and after repair to assess the initial corrosion state and evaluate the effectiveness and long-term performance of the repair.	Nos.	

**Repair type 3:** Basic repair of the RC elements with sacrificial Galvanic Anode of type 2 [up to **7 in Nos.** and located at the stilt level]

<b>Item</b>	<b>Description of repair type 2 on each RC element</b>	<b>Unit</b>	<b>Quantity</b>
<b>1</b>	Providing temporary high steel barricades with warning signs along the site's perimeter, including installation and removal.	Smt.	
<b>2</b>	Erecting MS props and H frames with cross bracings and jacks up to support the distressed structure during repairs.	Nos.	
<b>3</b>	Erecting self-supported two-legged B class tubular steel scaffolding with platforms and ladders for external façade work, including dismantling and site clearance after completion.	Sqm.	
<b>4</b>	Erecting dust/green net along the periphery to control debris spread during construction.	Sqm.	
<b>5</b>	Shifting debris from concrete breaking, flooring, and plaster to ground level and disposal.	Cum.	
<b>6.a</b>	Identifying loose concrete by light hammer tapping, mark areas with paint, and groove cutting of the perimeter to make perfect wedge shapes up to 25 mm depth.	Rmt.	
<b>6.b</b>	Removing existing concrete using low-impact high-frequency hammer or manual chipping, cleaning the surface with an air jet to the required depth or until unsound concrete is reached.	Sqm.	
<b>7</b>	Cleaning existing reinforcement with a wire brush, apply rust remover, and minimum two coats of Zinc Rich Primer.	Sqm.	
<b>8</b>	Providing additional Fe-500 grade steel reinforcement (or as found ex-situ) conforming to IS 1786 to compensate for corrosion loss, and Fixing of rebars is to be with pre left binding wires with existing steel at regular grid.(Make - JSW, Tata, SAIL, Vizag)	Nos.	
<b>9</b>	Installation of shear key connectors: Drilling straight or inclined holes up to 100 mm deep and 20 mm in diameter in concrete using an electrically operated drilling machine. This includes fixing 12 mm diameter shear key connectors in the concrete using a high-performance epoxy resin-based bonding agent. The bonding agent must comply with EN 1992-4 standards and provide a strong bond, enhanced load transfer, and resistance to environmental factors.	Nos.	
<b>10</b>	Drilling of holes, removal of dust, mixing of resin and hardener, and anchoring of rebars (as observed ex-situ) in existing concrete using polyester resin-based anchoring grout, ensuring rebar depth is 10 times the diameter of the drilling; where the diameter of bar is up to 16 mm, and necessary rebaring of reinforcement steel with 10 times dia depth of drilling (Make - JSW, Tata, SAIL, Vizag)	Kg	

11	<p>Installation of embedded circular shaped galvanic anode units utilizing zinc, in compliance with ASTM B418-95a Type II with zinc mass ranging around <math>55\pm 5</math> gm, cast around integral tie wires made of non-corrosive material for attachment to reinforcing steel. The anodes shall be encased in a cementitious mortar with a pH of 14 or greater. The spacing of the anodes shall follow the manufacturer's recommendations along the exposed steel area.</p> <p>The installation process includes removing loose concrete, thoroughly cleaning the corroded steel, soaking the anodes in water for 20-30 minutes (or as specified by the manufacturer), and securely fastening them to the rebar using tie wires.</p>		
12	Drilling of 12 mm dia. Holes up to 50-75 mm depth at intervals of 350 mm in the RC members, and to be cleaned with an air blower for installation of 12 mm Teflon nozzles (up to resistance of $5 \text{ kg/cm}^2$ ) with epoxy putty; to be followed by curing and nozzle cutting post-grouting without damaging the structure.	Nos.	
13	Grouting with a low-viscosity epoxy resin thermoset through nozzles using a pressure injector and accessories until refusal by the nozzle. To be included with mixing of materials in required quantities and as per manufacturer's instructions. For grouting, the grouting gun pressure shall be maintained at $3-4 \text{ kg/cm}^2$ pressure. Sealing of nozzles with epoxy putty and monitoring for leaks.	Kg	
14	Applying structural grade epoxy bond coat by brush to ensure adhesion between old and new concrete surfaces; it will be measured per sq.m of application.	Sqm.	
15	Replacement of carbonated and damaged concrete by installing slurry-tight formwork, pouring fluid micro concrete repair material, including centering, shuttering, and formwork removal, for repairs exceeding 30 mm depth, 40-60 mm thickness, density $1440 \text{ kg/m}^3$ .		
16	Micro-concreting (M-40) the column up to the level where the loose concrete was removed.	Kg	
17	Repairing of structural profiles using modified mortar system up to 15-20 mm thickness, including leveling and profiling.	Sqm.	
18	Electrochemical tests, such as half-cell potential mapping and linear polarization resistance (LPR), shall be conducted on RC elements before and after repair to assess the initial corrosion state and evaluate the effectiveness and long-term performance of the repair.	Nos	

**Repair type 4: Basic repair of the RC elements with caplet type corrosion inhibitor  
[up to 8 in Nos., and located at the stilt level]**

<b>Item</b>	<b>Description of repair type 2 on each RC element</b>	<b>Unit</b>	<b>Quantity</b>
<b>1</b>	Providing temporary high steel barricades with warning signs along the site's perimeter, including installation and removal.	Smt.	
<b>2</b>	Erecting MS props and H frames with cross bracings and jacks up to support the distressed structure during repairs.	Nos.	
<b>3</b>	Erecting self-supported two-legged B class tubular steel scaffolding with platforms and ladders for external façade work, including dismantling and site clearance after completion.	Sqm.	
<b>4</b>	Erecting dust/green net along the periphery to control debris spread during construction.	Sqm.	
<b>5</b>	Shifting debris from concrete breaking, flooring, and plaster to ground level and disposal.	Cum.	
<b>6.a</b>	Identifying loose concrete by light hammer tapping, mark areas with paint, and groove cutting of the perimeter to make perfect wedge shapes up to 25 mm depth.	Rmt.	
<b>6.b</b>	Removing existing concrete using low-impact high-frequency hammer or manual chipping, cleaning the surface with an air jet to the required depth or until unsound concrete is reached.	Sqm.	
<b>7</b>	Cleaning existing reinforcement with a wire brush, apply rust remover, and minimum two coats of Zinc Rich Primer.	Sqm.	
<b>8</b>	Providing additional Fe-500 grade steel reinforcement (or as found ex-situ) conforming to IS 1786 to compensate for corrosion loss, and fixing of rebars is to be with pre left binding wires with existing steel at regular grid.(Make - JSW, Tata, SAIL, Vizag)	Nos.	
<b>9</b>	Installation of shear key connectors: Drilling straight or inclined holes up to 100 mm deep and 20 mm in diameter in concrete using an electrically operated drilling machine. This includes fixing 12 mm diameter shear key connectors in the concrete using a high-performance epoxy resin-based bonding agent. The bonding agent must comply with EN 1992-4 standards and provide a strong bond, enhanced load transfer, and resistance to environmental factors.	Nos.	
<b>10</b>	Drilling of holes, removal of dust, mixing of resin and hardener, and anchoring of rebars (as observed ex-situ) in existing concrete using polyester resin-based anchoring grout, ensuring rebar depth is 10 times the diameter of the drilling; where the diameter of bar is up to 16 mm, and necessary rebaring of reinforcement steel with 10 times dia depth of drilling (Make - JSW, Tata, SAIL, Vizag)	Kg	

<b>11</b>	Installation of bipolar-type (with a vapor phase delivery mode) corrosion-inhibiting caplets into reinforced concrete (RC) elements at a specified depth, in holes drilled to a diameter compatible with the caplet size, as per structural requirements and manufacturer's recommendations. The caplets must be capable of releasing the inhibitor and protecting the steel by inhibiting both anodic and cathodic corrosion reactions. The drilled holes shall be filled with polymer cement putty.		
<b>12</b>	Drilling of 12 mm dia. Holes up to 50-75 mm depth at intervals of 350 mm in the RC members, and to be cleaned with an air blower for installation of 12 mm Teflon nozzles (up to resistance of 5 kg/cm <sup>2</sup> ) with epoxy putty; to be followed by curing and nozzle cutting post-grouting without damaging the structure.	Nos.	
<b>13</b>	Grouting with a low-viscosity epoxy resin thermoset through nozzles using a pressure injector and accessories until refusal by the nozzle. To be included with mixing of materials in required quantities and as per manufacturer's instructions. For grouting, the grouting gun pressure shall be maintained at 3-4 kg/cm <sup>2</sup> pressure. Sealing of nozzles with epoxy putty and monitoring for leaks.	Kg	
<b>14</b>	Applying structural grade epoxy bond coat by brush to ensure adhesion between old and new concrete surfaces; it will be measured per sq.m of application.	Sqm.	
<b>15</b>	Replacement of carbonated and damaged concrete by installing slurry-tight formwork, pouring fluid micro concrete repair material, including centering, shuttering, and formwork removal, for repairs exceeding 30 mm depth, 40-60 mm thickness, density 1440 kg/m <sup>3</sup> .		
<b>16</b>	Micro-concreting (M-40) the column up to the level where the loose concrete was removed.	Kg	
<b>17</b>	Repairing of structural profiles using modified mortar system up to 15-20 mm thickness, including leveling and profiling.	Sqm.	
<b>18</b>	Electrochemical tests, such as half-cell potential mapping and linear polarization resistance (LPR), shall be conducted on RC elements before and after repair to assess the initial corrosion state and evaluate the effectiveness and long-term performance of the repair.	No.s	

## Para 1: Terms and conditions

**1.1.** Work Completion Period will be within 6 weeks from the date of issue of the work-order.

**1.2.** The vendor must have carried out at least 5 similar jobs with all the above listed tests during the last 3 years for Government of India agencies and/or PSUs and/or autonomous agencies under central or state governments. Copies of relevant work orders should be enclosed.



- 1.3.** Consultant/Vendor must be registered and empaneled with any government department for Structural audit or Structural Stability of Structure. Empanelment certificate to be upload along with tender. Proper vendor registration certificate will be considered, and work order or work completion will not be considered.
  - 1.4.** Consultant/Vendor must have at least 10 years' experience in a similar type of work and monitoring. Incorporation certificate to be submitted.
  - 1.5.** Consultant/Vendor must own the equipment which evaluates corrosion rate of reinforcement by measuring polarization resistance using the galvanostatic pulse technique. Equipment should have Two operation modes viz. (1) only for half-cell potentials and electrical resistance (1 to 2 s/test), (2) for corrosion rate, half-cell potentials and electrical resistance (5 to 10 s/test), Equipment should be suitable for testing on rough or curved surfaces and with Easy-to-use software for reporting test results in 2D & 3D graphics - 1 Nos. Certification for the same must be provided.
  - 1.6.** Consultant/Vendor must have experience of conducting Advance Reinforcement Corrosion assessment with Galva pulse along with reinforcement scanning with GPR Scanning machine at any single Govt Project.
  - 1.7.** Consultant/Vendor must have experience of conducting residual life Analysis of RCC structures by measuring corrosion values by conducting adequate no of tests by high precision sensor based wireless testing tool.
  - 1.8.** Consultant/Vendor should have experience of providing and erecting Barricading using Steel post up to 2 mtr height, Steel props having min capacity 3 MT, Self-supported two-legged Tubular Scaffolding, Dust net/Green Net/safety net along the periphery, HDPE Cellular Foam sheet for Floor Protection in single government project.
  - 1.9.** Consultant/Vendor should have experience of providing and installing sacrificial Zinc Anodes (min 60 gm Zinc content) in chloride-contaminated or carbonated concrete in any single government project.
  - 1.10.** Consultant/Vendor must submit a copy of legal valid entity either in the form of a Limited Company or a Private Limited Company registered under the Companies Act, 1956. Bidder in the form of JV/consortium, Proprietorship, and Partnership is not permitted. Proof for supporting the legal validity of the Bidder shall be submitted.
  - 1.11.** The bidder must ensure that the water supplied by the vendor meets the required quality standards. A water quality testing kit must be available on-site, and the bidder must be proficient in its use.
  - 1.12.** Appropriate staging/scaffolding, ladder, boomer lift or equivalent approaching system at required locations will be provided by the bidder without compromising safety.
  - 1.13.** After the completion of the tests, restoration of the chipped/cored area (by micro-concreting or other measures) to the initial condition is in the scope of the Consultant/Vendor. Removal of the plaster/surface cover for the required tests is also in the scope of the Consultant/Vendor.
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**1.14.** The vendor shall be responsible for clearing all debris/malba from the site after each day of work.

**1.15.** The proposed number of RC elements for repair may change depending on the site conditions and during execution.

### **Submission Requirements:**

Two separate sealed envelopes to be submitted for technical and financial bid (**clearly labelled as “technical bid” and “financial bid”**) respectively.

Interested companies or individuals should submit their proposals by **11-10-2024, 5:00 pm** at the following address.

Prof. Deepanshu Shirole,  
Block IV, 1<sup>st</sup> floor, Room- 222  
Department Office of Civil Engineering,  
IIT Delhi, New Delhi, India 110016  
Indian Institute of Technology Delhi  
Office No: 011-2659-8548  
Email: [dshirole@civil.iitd.ac.in](mailto:dshirole@civil.iitd.ac.in)

### **Proposals should include:**

- Worker profiles highlighting qualifications, experience, and expertise;
- Adherence to the terms and conditions and technical requirements as stated with certifications; and
- Cost breakdown including any additional expenses.

### **Evaluation Criteria:**

Proposals will be evaluated based on:

- Qualifications, expertise, and experience of the workers, and the terms and conditions.
  - Alignment with the project's objectives and technical requirements.
  - Cost-effectiveness and value for the proposed work.
  - Previous delivery by company for similar projects earlier.
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## General Tender Terms & Conditions

01	Please quote prices for FOB New Delhi, inclusive of all taxes and duties.
02	Quote should be in Indian Rupees for agents of Indian manufacturers, or in foreign currency, for agents of foreign manufacturers, and needs to be valid for at least three months.
03	Attach all the technical literature and a list of similar installations done in India per the given terms
04	Mode of payment for purchases in foreign currency through wire transfer on delivery. Only bank charges within India are payable by FITT, IIT Delhi, all bank charges outside India are the responsibility of the seller. For purchases in INR, payment is on delivery.
05	Two separate sealed envelopes to be submitted for technical and financial bid (clearly labelled as “technical bid” and “financial bid”) respectively.
06	<b>Due date:</b> The tender has to be submitted off-line before the due date. The offers received after the due date and time will not be considered.
07	<b>Preparation of Bids:</b> The offer/bid should be submitted in two bid systems i.e. technical bid and financial bid. The Technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item wise price for the items mentioned in the technical bid. Note: -Comparison of prices will be done ONLY on the bids submitted for the Main Equipment/Technical specifications and anything asked as ‘Optional’ in the specs is not to be included for overall comparison.
08	<b>Acceptance/ Rejection of bids:</b> The Committee reserves the right to reject any or all offers without assigning any reason.
09	<b>Pre-qualification criteria:</b> (i) The terms and conditions mentioned in PARA 1 along with the technical specifications. Documents indicating the same shall be enclosed. (ii) Bidders should attach self-attested copies of proof of ownership of equipment. This may be in the form of original payment receipts, AMC contracts, etc. issued either by the OEM themselves or their authorized vendors. (iii) Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid. (iv) Bidder should have experience of providing and installing sacrificial anodes (min) in chloride-contaminated or carbonated concrete in any single government project.