नेशनल हाई स्पीड रेल कॉर्पोरेशन लिमिटेड
(केन्द्र सरकार एवं भाग लेने वाली राज्य सरकारों की सयुंक्त क्षेत्र कंपनी)
**National High Speed Rail Corporation Limited**
(A Joint Sector Company of Govt. of India and Participating State Government)

NHSRCL
National High Speed Rail Corporation Ltd.

No. NHSRCL/ST/MA/04/NHSRCL-MAHSR-C-4: Correspondence/88/.1/ Date: 08.01.2021
OST 50

**Without prejudice**

**To,**
**Larsen & Toubro Ltd.**
2nd Floor, Tower - B, Swastik Universal,
Opp. Central Mall, Dumas Road, Surat, Gujarat-395007

**Kind Attention: Mr. G Vinod, Task Force Leader**

**Sub:** C4 Package - Design and Construction of 237 kms long Viaduct (Ch. 156.6 - 393.7) including 04 stations (Vapi, Bilimora, Surat, Bharuch) & Surat Depot for MAHSR Project

**Regd.:** Civil Engineering Testing Laboratory-M/s Bhumi Research Centre (Surat & Vapi)

**Ref:** (i) LOA No. NHSRCL-CO/MA/CA/01/PACKAGE C4/6/.2/ OHQ975 dated 28.10.2020
(ii) L&T Letter No.LTC/HCI-HQ/NHSRCL/MAHSR/Pkg-C4/2020/050 dated 24.12.2020

Dear Sir,

With reference to Letter mentioned at sr. no. (ii) above, the document submitted by M/s L&T for approval of M/s Bhumi Research Centre (Civil Engineering Testing Laboratories) has been evaluated based on: (a) review of credentials (b) visit to Labs (at Vapi & Surat locations) and (c) Laboratory holding valid certificates of accreditation by NABL for tests referred at page nos. 71 to 74 of your letter. The proposed labs are found meeting the requirements.

Accordingly, NONO is issued hereby to M/s Bhumi Research Centre, Surat and Vapi for the aforementioned tests.

Thanking You,

08/01/2021

**(Amiyansu Das)**
**Chief Project Manager/Surat**
**Engineer**

Encls :- a/a

| Unique Dispatch No. | | | | | |
|---|---|---|---|---|---|
| 0 | 5 | 7 | - | 5 | 0 |

**CC: Executive Director/Contract, NHSRCL, HO**

## TESTING FACILITIES OFFERED BY BHUMI RESEARCH CENTER

| Sr. No. | NAME OF TEST | TEST METHOD |
|---|---|---|
| **A)** | **FIELD TESTS – SOIL & ROCK (ON SITE TEST)** | |
| 01 | Standard Penetration Test (SPT) | IS 2131 |
| 02 | Plate Load Test | IS 1888 |
| 03 | Cyclic Plate Load Test | IS 5249 |
| 04 | Modulus of Subgrade Reaction(K Value) | IS 9214 |
| 05 | PLT- Ratio Ev2/Ev1 | DIN 18134 |
| 06 | Field CBR Test | IS 2720 (Part 31) |
| 07 | FDD by Core Cutter | IS 2720 (Part 29) |
| 08 | FDD by Sand Replacement | IS 2720 (Part 28) |
| 09 | FDD by Water Replacement | IS 2720 (Part 33) |
| 10 | Electrical Resistivity | IS 3043 & IS 15736 |
| 11 | Pile Load Test | IS 2911 (Part 4) |
| 12 | Dynamic Cone Penetration Test(DCPT)# | IS 4968 (Part 1) |
| **B)** | **NDT TESTS – CONCRETE (ON SITE TEST)** | |
| 01 | Rebound Hammer Test | IS 13311 (Part 02) |
| 02 | Ultrasonic Pulse Velocity Tests | IS 13311 (Part 01) |
| 03 | Half Cell Potential Test | ASTM C 876 |
| 04 | Carbonation Test | BC 1881 (Part 201) |
| 05 | Cover Meter Test | BS 1881 (Part 204) |
| 06 | Rebar Mapping | BS 1881 (Part 204) |
| 07 | Pile Integrity Test | IS 14893 & ASTM D 5882 |
| 08 | Slab Load Test | IRC-SP-51-1999 & IS:456-2000 |
| **C)** | **SOIL (BORROW AREA)** | |
| 01 | Grain size Analysis | IS 2720 (Part 4) |
| 02 | Moisture Content | IS 2720 (Part 2) |
| 03 | Liquid Limit | IS 2720 (Part 5) |
| 04 | Plastic Limit | IS 2720 (Part 5) |
| 05 | Free Swell Index | IS 2720 (Part 40) |
| 06 | Specific Gravity | IS 2720(Part-3/Sec-1&2) |
| 07 | Shrinkage Limit | IS 2720 (Part 6) |
| 08 | Hydrometer Analysis | IS 2720 (Part 4) |
| 09 | Light Compaction | IS 2720 (Part 7) |
| 10 | Heavy Compaction | IS 2720 (Part 8) |
| 11 | Lab CBR Unsoak | IS 2720 (Part 16) |
| 12 | Lab CBR-96 hr (04 days) Soaking | IS 2720 (Part 16) |
| 13 | Direct Shear Test | IS 2720 (Part 13) |
| 14 | Unconfined Compression | IS 2720 (Part 10) |
| 15 | Triaxial Shear Test (UU) | IS 2720 (Part 11) |
| 16 | Consolidation Test | IS 2720 (Part 15) |
| 17 | Swell Pressure | IS 2720 (Part 41) |
| 18 | Permeability Test# | IS 2720 (Part 17) |
| 19 | Relative Density# | IS:2720 (Part 14) |

| Sr. No. | NAME OF TEST | TEST METHOD |
|---|---|---|
| D) | **ROCK/RUBBLE TEST** | |
| 01 | Specific Gravity | IS 13030 |
| 02 | Porosity | IS 13030 |
| 03 | Water Content | IS 13030 |
| 04 | Unconfined Compressive Strength | IS 9143 |
| 05 | Point Load Index | IS 8764 |
| 06 | Dry Density | IS 13030 |
| 07 | Sample Preparation Charges# | - |
| E) | **FINE AGGREGATE(SAND)** | |
| 01 | Fineness Modulus by Gradation | IS 2386 (Part 1) |
| 02 | Specific Gravity & Water Absorption | IS 2386 (Part 3) |
| 03 | Bulk Density | IS 2386 (Part 3) |
| 04 | Silt Content (Finer than 75 micron) | IS 2386 (Part 1) |
| 05 | Soundness by MgSO4 | IS 2386 (Part 5) |
| 06 | Soundness by Na2SO4 | IS 2386 (Part 5) |
| 07 | Alkali Reactivity Test# | IS 2386 (Part 7) |
| F) | **COARSE AGGREGATE(KAPACHI)** | |
| 01 | Gradation | IS 2386 (Part 1) |
| 02 | Specific Gravity & Water Absorption | IS 2386 (Part 3) |
| 03 | Bulk Density | IS 2386 (Part 3) |
| 04 | Flakiness & Elongation Index | IS 2386 (Part 1) |
| 05 | Impact Value | IS 2386 (Part 4) |
| 06 | Abrasion Value | IS 2386 (Part 4 |
| 07 | Crushing Value | IS 2386 (Part 4) |
| 08 | 10% Fines Value | IS 2386 (Part 4) |
| 09 | Stripping Value | IS 6241 |
| 10 | Soundness by MgSO4 | IS 2386 (Part 5) |
| 11 | Soundness by Na2SO4 | IS 2386 (Part 5) |
| 12 | Alkali Reactivity Test# | IS 2386 (Part 7) |
| G) | **CEMENT(OPC, PPC, SRC, PSC)** | |
| 01 | Consistency | IS 4031 (Part 4) |
| 02 | Initial and Final Setting Time | IS 4031 (Part 5) |
| 03 | Fineness by Blaine Air Permeability | IS 4031 (Part 2) |
| 04 | Soundness by Le-Chatelier | IS 4031 (Part 3) |
| 05 | Compressive Strength | IS 4031 (Part 6) |
| 06 | Fineness by Sieving# | IS 4031 (Part 3) |
| 07 | Density | IS 4031 (Part-11) |
| 08 | Chemical Analysis# | IS 4032 & IS: 12089 |
| H) | **WATER (CONSTRUCTION USE)** | |
| 01 | Water test for pH, TDS, Chloride, Sulphate (Construction )# | IS 3025 |



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| Sr. No. | NAME OF TEST | TEST METHOD |
|---|---|---|
| I) | **FLY ASH (POZZOLANA)** | |
| 01 | Compressive Strength | IS 1727 |
| 02 | Consistency | IS 1727 |
| 03 | Final Setting Time | IS 1727 |
| 04 | Initial Setting Time | IS 1727 |
| 05 | Fineness by Blaine Air Permeability | IS 1727 |
| 06 | Lime Reactivity | IS 1727 |
| 07 | Particles Retained on 45 micron Sieve | IS 1727 |
| 08 | Soundness by LeChaterlier | IS 1727 |
| 09 | Specific Gravity | IS 1727 |
| 10 | Chemical Analysis# | IS 1727 |
| J) | **CONCRETE CUBES/CORE/BEAM** | |
| 01 | Compressive Strength of Concrete Cubes | IS 516 |
| 02 | Compressive Strength of Accelerated Cured Concrete Cube | IS 9013 |
| 03 | Compressive Strength of Concrete Core including surface preparation, Capping, testing & reporting | IS 516 (Part 4) |
| 04 | Extraction of Concrete Core | - |
| 05 | Flexural Strength of Beam | IS 516 |
| 06 | Concrete Mix Design | IS 10262 |
| 07 | Slump Cone Test | IS 1199 |
| K) | **REINFORCEMENT BAR AND STRUCTURAL STEEL** | |
| 01 | Unit Weight | IS 1786 |
| 02 | Tensile, Yield, Elongation | IS 1608 (Part 1) |
| 03 | Bend Test | IS 1599 |
| 04 | Rebend Test | IS 1786 |
| 05 | Sample Preparation Charges for Structural Steel | IS 1608 (Part 1) |
| 06 | Chemical Analysis#<br>(Carbon, Sulphur, Phosphorus) | IS: 1786 |
| L) | **REINFORCEMENT COUPLERS** | |
| 01 | Unit Weight | IS 1786 |
| 02 | Tensile, Yield, Elongation | IS 1608 (Part 1) |
| 03 | Distance of Fracture | IS 16172 |
| 04 | Slip Test | IS 16172 |
| M) | **BRICKS(Burnt/Fly Ash)** | |
| 01 | Dimension (Height, Length, Width) | IS 1077 |
| 02 | Water Absorption | IS 3495 (Part 2) |
| 03 | Compressive Strength | IS 3495 (Part 1) |
| 04 | Efflorescence | IS 3495 (Part 3) |



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| Sr. No. | NAME OF TEST | TEST METHOD |
|---|---|---|
| N) | **SEVEN WIRE PLY STRAND FOR PRESTRESSED CONCRETE(PT WIRE)** | |
| 01 | Nominal Diameter of Strand | IS 14268 |
| 02 | Diameter of Center & Outer Wire | IS 14268 |
| 03 | Difference in Diameter of Centre Wire & Surrounding Wire | IS 14268 |
| 04 | Nominal Cross Sectional Area | IS 14268 |
| 05 | Length of Lay | IS 14268 |
| 06 | Nominal Mass per Unit Length | IS 14268 |
| 07 | 0.2% Proof Load | IS 1608 (Part 1) |
| 08 | Breaking Strength | IS 1608 (Part 1) |
| 09 | Modulus of Elasticity | IS 1608 (Part 1) |
| 10 | Elongation | IS 14268 |
| O) | **AAC BLOCKS (IS / ASTM Method)** | |
| 01 | Dimension | IS 2185 (Part- 3)/ASTM C 1693 |
| 02 | Bulk Density | IS 6441 (Part 1)/ ASTM C 1693 |
| 03 | Moisture Content | IS 6441 (Part 1)/ ASTM C 1693 |
| 04 | Compressive Strength | IS 6441 (Part 5)/ ASTM C 1693 |
| 05 | Drying Shrinkage | IS 6441 (Part 2)/ ASTM C 1693 |
| P) | **THIN BED MORTAR FOR AAC BLOCK (JOINT MORTAR)** | |
| 01 | Split Tensile Strength | ASTM C 1660 |
| Q) | **PAVER BLOCKS** | |
| 01 | Cross Sectional Area | IS 15658 (Annex C) |
| 02 | Water Absorption Test. | IS 15658 (Annex C) |
| 03 | Compressive Strength Test. | IS 15658 (Annex D) |
| 04 | Flexural Strength/Breaking Load | IS 15658 (Annex G) |
| 05 | Thickness of Wearing Layer | IS 15658 (Cl 6.2.3) |
| R) | **TILES (CERAMIC TILES / PRESSED CERAMIC (VITRIFIED) TILES)** | |
| 01 | Dimension(Width, Length, Thickness) | IS 13630 (Part 1) |
| 02 | Water Absorption | IS 13630 (Part 2) |
| 03 | Modulus of Rupture | IS 13630 (Part 6) |
| 04 | Breaking Strength | IS 13630 (Part 6) |
| 05 | Hardness (Mohs) | IS 13630 (Part 13) |
| S) | **TILES (CHECKERED CEMENT CONCRETE TILES/ CEMENT CONCRETE FLOORING TILES)** | |
| 01 | Dimension(Width, Length, Thickness) | IS 13801 |
| 02 | Water Absorption | For Checkered Tiles |
| 03 | Wet Transverse Strength | IS 1237 |
| 04 | Thickness of Wearing Layer | For Flooring Tiles |
| T) | **BUILDING STONE (GRANITE, MARBLE, KOTA)** | |
| 01 | Specific Gravity | IS 1124 |
| 02 | True Specific Gravity | IS 1122 & IS 1130 |
| 03 | Water Absorption | IS 1124 & IS 1130 |
| 04 | Compressive Strength | IS 1121 (Part 1) |
| 05 | Hardness (Mohs) | IS 13630 (Part 13) |