



# SHIVAM CONCRETE TECHNOLOGY & CONSULTANCY PVT. LTD.



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A One Stop Provider For Enhancement of Serviceability and Life of Structure



**Vision:** To be a leader in providing all possible solution in field of Enhancing Serviceability and Life for all type of structures

**Mission:** To satisfy client by providing effective solutions through continuous innovative and faster (In – time) execution of project through strong planning AND being quality conscious

### Introduction

At Shivam Concrete Technology we thrive to give best services in most professional way. For ensuring best services we have adopted ISO 9001:2008 practices and International Repair/Rehabilitation Standard. We are member of International Repair Institute, American Concrete Institute, and Indian Concrete Institute. We provide services ranging from Visual Inspection to Modern Testing (NDT), Drafting strengthening/rehabilitation proposals to carrying out the rehabilitation work.

Following the dreams and Vision of providing best service it is now change it focus to become one stop solution provider for all rehabilitation needs of structure. Now we have been providing best treatments e.g. Polymer Modified Cement Mortar, Fibre reinforced repair mortar, Polymer Cement Grout with Corrosion Inhibitor, Fibre Wrapping, etc. Till date we has carried rehabilitation of over 150 bridges for various agency e.g. National Highway Authority of India, Gujarat State Road Development Corporation (GSRDC) and State Government by serving Clients like L&T - ECC, L&T IDPL, IRB, NCC, Sadbhav Engineering, Dosal, LG Patel Engineering, M S Khurana and many more.

As of now we have inspected and design rehabilitation proposal for more than 125 bridges for L&T (NHAI Project), IRB (NHAI Project) and Public Works Departments. And carried out testing NDT testing for over 135 bridges and Bridge Load test for 30 bridges for L&T, IRB Infrastructure Developer Ltd. Madhucon Projects Ltd., JMC Projects Ltd. and PWD (Gujarat & Silvassa)

As of now we have lifted and replaced bearings of 7 spans of existing bridges. And lifted and placed POT PTFE bearings of 95 spans of New Bridges which were constructed without POT PTFE Bearing.

### Area of Specialisation/Services

1. Structural Strengthening by Fibre Wrapping and modern techniques
2. Bridge Lifting and replacement of Bearing
3. Structural Evolution by NDT Testing
4. Bridge Load Test and Rating of Bridge
5. Consultancy for rehabilitation & strengthening of the civil Structures
6. Structural Modifications and Extension
7. Rehabilitation & Strengthening of civil structures (e.g. Bridges, Buildings, etc.)
8. Pile Testing with Modern Technique (e.g. Rock anchoring, Dynamic Testing)
9. Pre Bidding Services – Provides cost of rehabilitation prior to bidding the tender



## Our Esteem Client

- L & T, ECC – HGSRP (Halol Godhra Shamlaji Road Project)
- L&T, ECC – AVMRP (Ahmedabad Viramgam Maliya Road Project)
- L&T, ECC – PSRP (Palanpur Swaroopganj Road Project)
- L&T, ECC – RJVRP (Rajokt Jamnagar Vadinar Road Project)
- L&T, ECC – SGRP (Samkhali Gandhidam Road Project)
- L&T Vadodara Bharuch Expressway Ltd.
- L&T Krishinagiri Thapor Toll Road Ltd.
- L&T Panipat Elevated Highway Ltd.
- IRB Infrastructure Developers Ltd.
- Nagarjuna Construction Company (NCC)
- Dodsai Private Limited
- Sadbhav Engineering Ltd
- U P State Bridge Corporation Ltd
- LG E & C – Patel J/V
- Madhucon Projects Ltd.
- D R Agarwal Infracon Pvt. LTD.
- M/S Harcharan Singh & Co.
- Apollo Hospital (L&T)
- Public Works Department, Gujarat and Silvassa



**LARSEN & TOUBRO**  
It's all about Imagineering



## Public Works Department Gujarat State



**NAGARJUNA CONSTRUCTION COMPANY LIMITED**

An ISO 9001-2000 Company

The



**Dodsai**

Group

**UP STATE BRIDGE CORPORATION LTD.**

(A State Govt Undertaking)  
Lucknow (India)

## 1. Structural Strengthening by Fibre Wrapping and modern techniques

Common Conventional method for strengthening of R C C structure is been carried by Jacketing, guniting and steel plate bonding. These techniques are cumbersome, messy, time-consuming and labour – intensive. It also increases dead load; reduce usable space by increasing size of member & recurring maintenance.

But wrapping with advance fibre composite can eliminate all disadvantages of conventional technique. Following are it advantages:

- It is very light in weight so increase in dead load is very insignificant (approx. 1 Kg per sqmt)
- Faster and convenient application results in lot of time saving
- It is highly durable material (major contain are epoxy and glass/carbon fibre)
- It is does not corrode and inhibits future corrosion
- Very little maintenance during service life
- It enhance compressive and tensile strength of RCC by 40% to 50%

We have increase strength of various components of bridge (e.g. Pier, Girder, Diaphram Girder and Bearing Pedestal) by wrapping. We have strengthened over 3000 sq mt of various structural elements. We have experience team for identifying assessing requirement of wrapping and application. Strengthening by wrapping was carried in NH 14 Project (Palanpur Swaroopganj), NH 8 Project (Vadodara – Bharuch), GSRDC (Halol Godhra Shamlaji) Road Project, Zeinth School - Vadodara



Damaged Girder - Before



After – Strengthened Grider



Pier having less strength – Before



After – Strengthened Pier

## 2. Bridge Lifting and replacement of Bearing

Bearing is very important structural element of bridge. Its malfunction result into very serious damage to superstructure and substructure. So damage/malfunctioning bearings needs to be replaced. Hence to cater very important need of bridge we carry out inspection of bearings to identify damage/malfunctioning bearings. Then we assess the structure for preparing possible lifting arrangement. We have replaced bearings of 7 spans of existing bridges where superstructure was badly damaged in very adverse conditions.

Now a days construction period has come down drastically so speedy construction new techniques has to be adopted. So in some case bearings are placed after casting of superstructure (due various reasons e.g. non availability of bearings at time construction, change in design, delay in the project, etc.). So Installation of bearings has to carry out by lifting the superstructure. We have carried out installation of bearings of 95 spans for L&T (Rajkot – Jamnagar – Vadinar Road Project) on fast track basis (i.e. in 4 months)

We have modern & variety of hydraulic jacks for all kind of lifting. We have more than 70 hydraulic jacks which are operated by Power Pack.

Double acting	Single Acting	Total
100 Tn: 26 nos	100 Tn: 14 nos	100 Tn: 40 nos
250 Tn: 14 nos.	250 Tn: 17 nos	250 Tn: 31nos.
Power Pack: 5 nos	Power Pack: 6 nos.	Power Pack: 11 nos
14 nos. Mechanical Jacks of 60 Tn		

### Bearing Replacement



Damaged Bearing



Lifting arrangement



Placing of Pedestal on Pier



Power Pack for Lifting





Extension of pedestal



After replacement of bearing

## Bearing placement in New Structure



Superstructure without Bearing



Lifting Arrangement



Fixing bottom portion of Bearing



Chemical Fixing of top portion of Bearing

### 3. Structural Evolution by NDT Testing

It is very vital to understand the problem before recommending its solution. In rehabilitation to understand the problem one needs experienced eyes and supported by testing to recommend the rehabilitation proposal. As per IRC SP: 40 & IRC SP : 37 Visual Inspection is very vital step but NDT testing is equally important step. For supporting our experience in field of rehabilitation we have developed in-house NDT testing facilities.

Services:

- Ultrasonic Pulse Velocity (USPV)
- Core Cutting
- Cover meter (mapping of reinforcement)
- Ground Penetrating Radar (GPR)
- Rebound Hammer
- Impact Echo
- Half Cell Potential
- Rate of Corrosion
- Carbonation Depth
- Pile Load Test (Static & Dynamic)

We have carried out testing NDT testing for over 135 existing bridges and 120 new bridges for L&T, Madhucon Projects Ltd., JMC Projects Ltd. and PWD (Gujarat & Silvassa)

Projects Completed:

New Bridges: - Quality Assurance

- ❖ NDT Testing for quality assurance of concrete work of all newly constructed bridges of Palanpur – Swaroopganj Section, NH – 14 for L&T
- ❖ NDT Testing for quality assurance of concrete work of all newly constructed bridges of Halol – Godhra – Shamlaji Road Project, for L&T
- ❖ NDT Testing for quality assurance of concrete work of all newly constructed bridges of Rajkot – Jamnagar – Vadinar , for L&T

Existing Bridges: - Strength and Condition Assessment

- ❖ NDT Testing for Strength and Condition Assessment of 11 existing bridges of Gandhidham – Samakhali Road Project for L&T
- ❖ NDT Testing for Strength and Condition Assessment of 20 existing bridges of Rajkot – Jamnagar – Vadinar Road Project for L&T
- ❖ NDT Testing for Strength and Condition Assessment of 70 existing bridges of Halol – Godhra – Samlaji Road Project for L&T
- ❖ NDT Testing for Strength and Condition Assessment of 20 existing bridges of Ahmedaba – Viramgam – Maliya Road Project for L&T

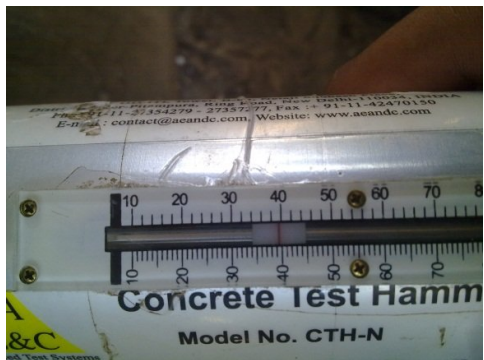
- ❖ NDT Testing for Strength and Condition Assessment of 3 existing bridges of Krishanagiri – Thapor Toll Road for L&T
- ❖ NDT Testing for strength and Condition Assessment of a existing bridge of Vadodara – Bharuch Expressway for L&T
- ❖ Visual Inspection for routine Maintenance of Elevated Highway at Panipat for L&T
- ❖ NDT Testing for Strength and Condition Assessment of 6 existing bridges of Palanpur – Swaroopganj Section, NH – 14 for L&T
- ❖ NDT Testing for Strength and Condition Assessment of 4 existing bridges of Gujarat State Highway for Public Works Department (PWD)



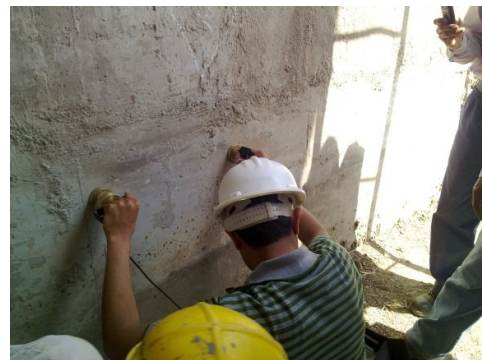
Core Cutting



Cover meter



Rebound Hammer



Ultrasonic Pulse Velocity test



#### 4. Bridge Load Test and Rating of Bridge

Bridge load test is very important and critical test for confirmation of construction of bridge is as per design. We carry out testing as IRC SP: 51 and IRC SP : 37

We have very experience team of professional for bridge load test. Our team has carried out BLT of 30 bridges. We have team to design the bridge load test and carried out Analytical Load Test. Analytical bridge load is very useful for existing bridge. Normally Bridge Load test is carried out by Conventional method of platform and loading is done with sand bag/concrete block. However, this method is very risky, inconvenient, time consuming and costly. If test is not performed with care then there are chances of collapse of span. So we have adopted newer loading method which reduces time by 60% to 70% and cost by 30%. Newer loading is been done by commercial available test vehicles.

Projects Completed:

- ❖ Bridge Load testing for quality assurance of 3 newly constructed bridges of Rajkot – Jamnagar Road Project for L&T
- ❖ Bridge Load testing for quality assurance of 7 newly constructed bridges of Halol– Godhra- Shamlaji Road Project for L&T
- ❖ Bridge Load testing for quality assurance of newly constructed flyover in Pimpri for JMC Projects
- ❖ Bridge Load testing for quality assurance of 14 newly constructed bridges of Palanpur – Swaroopganj Section, NH – 14 for L&T
- ❖ Bridge Load testing for quality assurance of 2 newly constructed bridges of Jaipur – Agra Expressway, NH – 11 for Madhucon Projects Ltd
- ❖ Bridge Rating of Existing ROB at Chalthan on Bharuch – Surat Section, NH 8 for IRB Infrastructure developer Ltd.
- ❖ Bridge Load testing for quality assurance of newly constructed flyover on SG Highway (NH 8 C) for DRA Infracon Pvt. Ltd.



Modern loading with Test Vehicle



Staging Arrangement

5. Consultancy for rehabilitation & strengthening of the civil Structures:

We adopt very systematic approach for the consultancy of any rehabilitation/strengthening project. We follow approach listed below:

- a. Understand the need of the client and project
- b. Identify and analysis root cause of problem
- c. Do the literature review and discussion for all kind possible solution
- d. Choose best possible solution as per requirement of structure and its durability

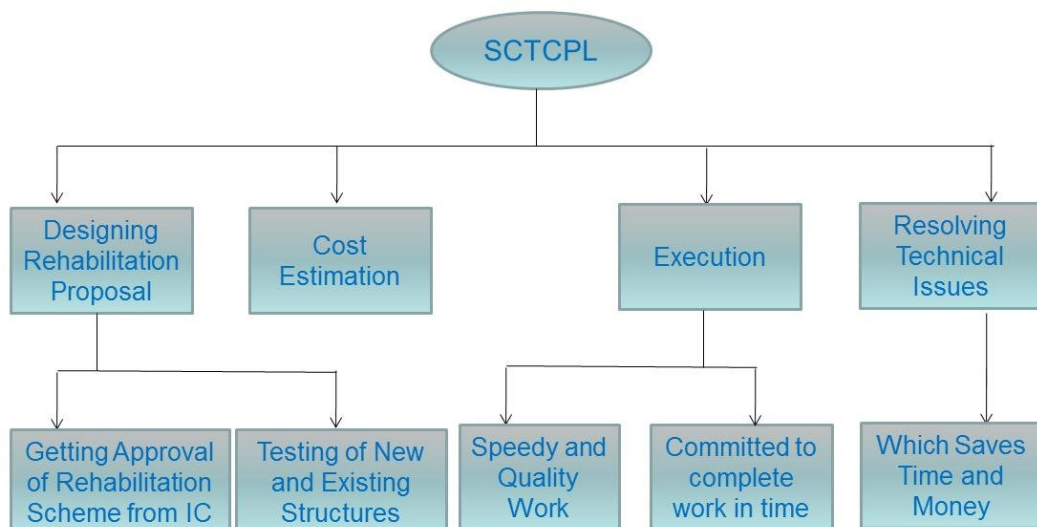
We follow National and International Code e.g. IRC SP: 37, IRC: SP 40, EN 1504, and many other as well research paper in our approach in consultancy

We take up consultancy for:

- a. Preparation of Rehabilitation / Strengthening proposal
- b. Design Lifting / Bearing replacement proposal
- c. Routine inspection of bridges
- d. Special Case investigation of the structure

As of now we have inspected and design rehabilitation proposal for more than 125 bridges for L&T (NHAI Project), IRB (NHAI Project) and Public Works Departments. Carried out routine inspection of 5 bridges and Design lifting/bearing replacement proposal for 8 spans.

**We shoulder the responsibility and be a part of the Team**



## 6. Structural Modifications and Extension

In today's world space is reducing, so one need to use existing structure and go for vertical extension or to modify existing structure to take more load. In either case we have solution to fit the client requirement.

We have our team of designer and technology experts to prepare complete proposal for vertical extension / modification of the structure.

One such case study is of Apollo Hospital – Gandhinagar

### Problems:

- ❖ Helipad on roof top will increase the loading and induce lots of vibration
- ❖ To locate affected structural components
- ❖ Redesigning of those affected structural components

### Solutions Worked Out:

- ❖ To locate affected structural component structural designer was consulted.
- ❖ They (Structural Designer) analysis the existing structure with additional loading due Helipad
- ❖ Based on analysis it was found out that only certain columns and footing of ground floor and first floor needs to be strengthen
- ❖ It was then proposed to increase size of column from 600 mm × 600 mm to 1000 mm dia
- ❖ It was also proposed to increase thickness of footing y 200 mm

### STRENGTHENING OF FOUNDATION:

- ❖ Existing foundation was opened
- ❖ Additional reinforcement was tie to existing after exposing the later by chipping out them
- ❖ And concreting of requisite size was carried out

### STRENGTHENING OF COLUMN:

- ❖ Top surface of column was roughened and shear anchor was provided with use approved chemical
- ❖ Reinforcement was tied to the existing square column (600mm\*600mm) to make it round
- ❖ Reinforcement from footing were extended to ground floor and from ground floor to 1st floor without disturbing existing beams on four side of columns
- ❖ This reinforcement were covered by shortcerting of 43 MPa Material

### Foundation:



Chipping existing Foundation



Anchor for additional reinforcement





Additional reinforcement is weld with existing

### Column:



Existing Column



Anchor for additional reinforcement



Additional Reinforcement tied to anchor



View of circular column after strengthening

## 7. Rehabilitation & Strengthening of civil structures (e.g. Bridges, School Buildings, etc.)

### Needs:

- ❖ To Sustain bridge for remaining life of BOT project
- ❖ Enabling smooth flow of traffic
- ❖ To Reduce Total Cost of Ownership (by reducing overall maintenance)
- ❖ To Avoid Mishap
- ❖ To Reduce Closure of Traffic movement

### Factors:

- ❖ Lapse during Construction of Bridge
- ❖ Wear & Tear .i.e. effect of Aging
- ❖ Unattended minor repair i.e. Poor Maintenance
- ❖ Damages due to wrong selection of type of repair/rehabilitation method
- ❖ Faulty Design
- ❖ Damages due to excess loading
- ❖ Damage due to Accident

### Repair Techniques

- ❖ Replacement of structural components
- ❖ Pressure injection Grouting
- ❖ Polymer Modified Cement Mortar
- ❖ Concrete Overlays
- ❖ Structural upgrades
- ❖ Corrosion mitigation
- ❖ Wrapping

### Repair Materials

- ❖ Cementious grouts
- ❖ Chemical Grout (Epoxy,etc.)
- ❖ Fibre (Glass/Carbon) wrap
- ❖ Sealants
- ❖ Membranes
- ❖ Corrosion Inhibitors
- ❖ Protective Coatings

We have experience and skill staff & manpower. Over strength is to execute most critical & difficult strengthening/rehabilitation project at record speed and with best quality. For the same we have adequate machinery, equipment and manpower (e.g. scaffolding for 15 nos of 20 mts span, Grouting Equipment for 4 bridges, 25 chippers, 30 drilling machine and labour force over 200)

Till date it has carried rehabilitation of over 150 bridges for various agency e.g. National Highway Authority of India, Gujarat State Road Development Corporation (GSRDC) and State Government by serving Clients like L&T ECC, L&T IDPL, IRB, NCC, Sadbhav Engineering, Dosal, Patel Engineering, M S Khurana and many more.



Damaged girder



Crack in Gunited Girder



Rehabilitated Girder



Rehabilitated Girder



Damaged Column

Damaged Column



Rehabilitated Column



8. Pile Testing with Modern Technique (e.g. Rock anchoring, Dynamic Testing)

Pile foundations are very important and critical in today's construction. To ensure pile can take requisite load pile testing is very common and necessary. Normally conventional method (Kentledge method i.e. concrete block and platform) is used. However this method is very inconvenient, cumbersome, costly and time consuming. So modern, faster and economical method e.g. rock anchoring, anchor pile & Dynamic (Pile analyzer: needs to be adopted. These methods require very less space as compare to Kentledge method.

Rock anchor save almost 40% cost and 60 to 70% time as compare to kentledge method. Similarly Dynamic pile load save almost 70% of cost and 80 to 90% of time as compare to kentledge method.

We have adopted these both methods (i.e. Rock anchor and Dynamic Pile load) for one of our client and they were very happy with them as it saved them cost and time.

Dynamic Pile Testing



Arrangement for Dynamic Pile Test



Hammer arrangement for Dynamic Pile Test

Rock Anchor Method



Arrangement of Rock Anchor Method



Cable for Rock Anchoring





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