

# TSR Engineering Services

Material Testing • Inspection • Sourcing • Contracting

## Building and Infrastructure Audit

June 2016



# Overview

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- About TCR Engineering Services
  - History, Profile, Leadership Team
  - Global Vision and the India Advantage
  - Customers all over the world
- Quality Assurance Services
  - Metallography
  - NDT Services
  - Fatigue Testing, CTOD and Fracture Toughness
  - Material Testing Laboratory
  - Civil Structural Audit
  - Failure Analysis and Engineering Consulting
  - Third Party Inspection and Sourcing Assistance
  - Risk Based Inspection, Fitness for Service
  - Stress Analysis, CAD/CAM, MiC and LIMS Software
- TCR Institute for Materials Technology
- Plant Shutdown Manpower Deployment



# Quality Assurance Experts



- **Serving Quality Conscious Global Clients since 1973**
  - Located in Mumbai, Vadodara (India), Saudi Arabia, Kuwait, UAE, Malaysia and South Africa
  - Over 2500+ Customers
    - ◆ India location of TCR is preferred back-end outsourced quality assurance center for some of the world's leading companies including Halliburton, Siemens, MBH and EIL
- **State-of-the-art Material Testing and Engineering Research Facility**
  - Metallurgical Testing Labs in Mumbai and Vadodara are accredited to BIS, ISO 17025 and NABL standards
    - ◆ Lab in Dammam is accredited to ISO 9001
  - NDT and PWHT services in Saudi Arabia is approved by SABIC, Saudi Aramco, PetroRabigh, Tasnee, SWCC and Saudi Electric Company
  - Approvals in Kuwait from KOC, KNPC, Heisco
- **Strong Team comprising of Metallurgists, Fatigue Testing Experts, Corrosion Engineers, Failure Analysis Investigators, Welding Inspectors, RBI Facilitators, ASNT Level III experts and NDT Technicians under one roof**
  - 120 team members in India, 100+ Internationally
- **Constant Innovation and Research**
  - Documenting Knowledge and Experience over the years
  - Addition of New Equipment and Cross-Training of Employees

# What is Structural Audit

- Structural Audit is an overall **health and performance check-up of a building** like a doctor examines a patient. It ensures that the building and its premises are safe and have no risk. It analyses and suggests appropriate repairs and retrofitting measures required for the buildings to perform better in its service life. Structural audit is done by an experienced and licensed structural consultant.



# Purpose of Structural Audit

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- To save human life and buildings.
- To understand the condition of building.
- To find critical areas to repair immediately.
- To comply with statutory requirements.
- To enhance life cycle of building by suggesting preventive and corrective measures like repairs and retrofitting.

# Structural Audit – Why and When

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**The structural stability is affected by number of reasons such as Aging, Construction Quality, Exposure condition, External forces etc.**

**The Structural Audit is a process of assessing the present health of structure, identifying the loads & forces acting on the structure, identifying the effects of these loads and forces and finally assessing the stability & safety of the structure to withstand for its remaining life.**

**If the structural audits are carried out on regular intervals of at 5 years, it helps to identify the problems in the initial stage. After structural audit, if the required repairs / rehabilitation and preventive maintenance are carried out regularly, it substantially reduces the overall maintenance / repair cost of the structure.**

# Bye Laws

As per clause No.77 of revised Bye-Laws of Cooperative Housing Societies. The Society shall cause the 'Structural Audit' of the building as follows:

SOCIETY BYE LAWS



1. For building aging between 15 to 30 years once in 5 years
2. For building aging above 30 years Once in 3 years

## The Structural Audit is carried out mainly for :

- For Insurance
- For Bank – Mortgage
- For Valuation
- Structure showing Distress
- Proposed Additions , Alterations , Extensions in building / structure
- For Damage assessment due to earthquake, fire, blast, vibration, corrosion etc.



# Is it that important???



**YES.....!!!**

## Advantages of Structural Audit:

- To save **LIFE & PROPERTY** and warn about any potential threats as regards failures.
- To know the health of the building and to protect / project the expected future life.
- Highlight the critical areas that need to be attended with immediate effect.
- To proactively assist the residents and the society to understand the seriousness of the problems and the urgency required to attend the same.
- To comply with Municipal or any other statutory requirements.

## Is it a costly process???

Cost in this case is totally depends on the kind of deterioration of the building. It had been observed that any building maintained properly / under proper paint & repair over a period of time lead to good results during audit investigation with very minor cost impact as compare to major repair work or demolition and rebuilding.



# Who can do this job for me???

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Bye Law permits the management committee to get this work done from the respective municipal corporations approved architect / structural engineer / organization panel members.



## Structural Audit carried out by TCR includes :

- Testing, inspection and auditing service provider does these jobs for many housing sector developers with their partners for more than 20 years.
- We are registered with various municipal corporations for providing services to the customers from Government and private sectors.
- We have full-fledged set up to carry out these types of activities and enjoy its status as knowledgeable and customer oriented service provider.

# Our Structural Audit Services include:

## Part A – Visual Inspection

- Visual inspections of individual building / structures from inside and outside and to study present status of different structural members.
- Study of Architectural / RCC / Structural drawings ( If available )
- Photographic Survey
- Noting various observations such as-
  - a. Load transfer system,
  - b. Structural framing system,
  - c. Structural deficiencies,
  - d. Settlement if any,
  - e. Cracks in RCC members,
  - f. Cracks in masonry / plaster
  - g. Leakages,
  - h. Loads on structure,
  - i. Defects in non-structural elements etc.
- Identification of broad areas / locations in the structure requiring further detail investigation and for conducting various Non-Destructive Tests



# Our Structural Audit Services include:

## Part B – Non Destructive Evaluation

- In addition to visual inspection, the real strength and quality of a concrete structure need to be checked with non-destructive tests.
- A number of non-destructive tests (NDT) for concrete members are available to determine present strength and quality of concrete.
- To Conduct Non-Destructive tests as required in detail visual inspection,



Ultrasonic pulse velocity test



Half cell potential test



Rebound hammer



Ultrasonic pulse velocity

# Our Structural Audit Services include:

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## **Part C – Repair & Rehabilitation Consultancy**

- **To prepare detail report of visual inspection & various ND tests**
- **Interpretation of ND test results.**
- **Diagnosis & Root cause analysis of the problems / observations**
- **To prepare Repair & Rehabilitation scheme to make structure durable, healthy and to stand for a long life.**
- **Prepare technical specifications & draft tender document for repair and rehabilitation.**
- **Prepare detail estimate for the same.**
- **Scrutinize the tender documents.**
- **Periodically visits to inspect the work**
- **Issue Structural Stability Certification after completion of entire job.**

# Structural Audits Performed

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**Vikas Complex, Thane west**  
**(Residential Building)**



**K.C. College, Thane**  
**(College)**



**Essential Power transmission  
Pvt. Ltd., Andheri**  
**(Corporate building)**

# Mechanical Testing Lab in India

- Highly trained staff possesses extensive experience in engineering, mechanics, and materials science
- Comprehensive range of mechanical testing services
  - Tensile Testing including elevated temperature tests
    - ◆ UTM of 1000 KN capacity, UTM of 400 KN capacity and UTM of 30000 lbs capacity with Electronic Controls and Extensometers
  - Charpy Impact Test (weld and HAZ), Izod Impact Test
  - Fatigue Testing and CTOD
  - Weldability
  - Bend Test, Compression
  - Flaring / Flattening
  - Hardness Testing (Rockwell, Brinell, Superficial Micro Hardness)
  - Nick Break
  - Proof Load
  - Fasteners
  - Hydraulic / Pneumatic Test, Component Testing, and more.
- Fully equipped machine shop undertakes precision fabrication as per specification requirements.
  - CNC lathes, mills, stress-free grinding equipment, saws, surface grinders, and more.



# Chemical Analysis Lab in India

- State-of-the-Art Spectrometers and Wet Chemistry lab
  - Rapid, accurate analysis of individual & combined chemical elements
- Conducting analytical tests for Ferrous, Non Ferrous Metals, Ceramics, Glass, Refractories, Minerals and Ferro Alloys
  - Aluminum Alloys, Carbon, Low Alloy & Stainless Steels, Cobalt Alloys, Copper Alloys, Jewelry and Dental Alloys, Magnesium Alloys, Nickel Alloys, Superalloys, Titanium Alloys, Tool Steels, Zinc Alloys, Cast Iron, Weld Metals, Gases, Industrial Water and Process Solutions
- Classical Wet Chemistry using Gravimetry and Titrimetry procedures
- Analytical and interpretive expertise
  - Method development and validation, Identification of unknown materials



ARL Quantis  
Optical Emissions Spectrometer



Glow Discharge  
Spectrometer



Optical Emission  
Spectrometer



Inductively Coupled Plasma  
Spectrometer



Automatic  
Carbon - Sulphur  
Determination



Atomic Absorption  
Spectrometer



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# Questions?

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