Implementation of Codes and Standards in India's Transport Sector

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OUTLINE OF PRESENTATION

1. INTRODUCTION
2. STATUS OF INDIAN CODES & COMPLIANCE ISSUES
3. TECHNO-LEGAL REGIME
4. THE WAY FORWARD

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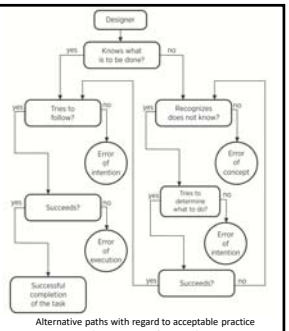
INTRODUCTION .....

1. Engineers and Contractors rely on Standards and Codes of Practice to serve as a guide in the execution of their design and workmanship obligations.
2. Standards or Codes of Practice reflect the best practices and cumulative knowledge of the construction industry over a period of time.
3. Though Codes are only guidelines, they become legal binding once it is mentioned in the contract document. Failure to follow these Standards or Codes of Practice amounts to a clear cut case of negligence.

INTRODUCTION .....

Challenge of Safe Design and Construction

- Error of intention
- Error of concept
- Error of execution



Alternative paths with regard to acceptable practice (Novak and Arafah, 1994)

INTRODUCTION .....

4. In India, non compliance of codes and lack of structural safety of infrastructure is a matter of grave concern.
5. Majority of the problems on safety arises from 'Error of Intent', or 'Error of Concept', which are man-made and avoidable.
6. Large number of Engineers in India are not skilled enough to carry out designs conforming to codes and standards.

INTRODUCTION .....

7. Several countries have significantly reduced structural failure risk vis-à-vis number of deaths, by upgrading their codes, by strict regulation of engineering practices, and by stopping un-engineered construction.
8. The 'safety & sustainability culture' is lacking in our country & we continue to witness many failures on structures, which causes huge number of deaths, inconvenience to public as well as loss of property. Besides, we do little to reduce Carbon footprint.
9. The problem of Infrastructure Safety cannot be addressed by only the Structural Engineering fraternity, though they have an important and crucial role to play in this regard.

INTRODUCTION .....

10. Building 'safety culture' requires sustained attention and effort on multiple fronts by a diverse set of stakeholders (i,e. including the politicians, bureaucrats, academicians, construction industry, structural engineers, professional associations, academic institutions, public at large …etc.).
11. Critical needs today for Safe structure are :
    - Codes & Standards which are at par with the International Codes & Standards. Global interoperability is the need of the day.
    - Competence-based licensing of engineers
    - Regulation and Enforcement of codes by Government bodies
    - Licensing of Engineers & Sustained training and education for all
    - R&D for appropriate design and construction methods

INTRODUCTION .....

12. Large Infrastructure projects have significant impacts on economic, social and cultural life in a locality, and as a consequence, infrastructure failures can have widespread negative impacts across the community.
13. Private sector participation is increasing in infrastructure projects. There are no independent regulatory body in India for Infra projects. For Central Projects, NHAI acts as regulator as well as operator. States have their own corporations or agencies who acts as regulator or operators. Same is the case with Railways. This is a problem as Investors have no recourse to an independent regulator in case of any dispute. Dispute resolution is a very long drawn process, which also needs overhaul.

INTRODUCTION .....

11. Engineering profession is not a regulated profession in India unfortunately. Graduation degree cannot be the only basis to empower engineers to perform very high skill level of engineering design and construction activities. Education level in academic institutions have gone down significantly over last 10 years.
12. Increasingly, the structural engineering profession is able to attract only poor quality of engineering talent. The industry has not seen much innovation in the past few decades and is thus not viewed as a "happening" field by young engineer aspirants.
13. The young engineers entering the industry do not get any formal training. They are forced to a production mode with only half-baked knowledge.

INTRODUCTION .....

14. In order to ensure safe built environment, assessment of engineers competency is extremely important. There should be a mechanism for licensing of engineers and a continuous process of evaluation of his/her professional career. There are a few professional bodies who have started this process (ECI, IEI), but these associations are not empowered & therefore in absence of any regulatory

BRIEF OUTLINE OF PRESENTATION

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STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

1. Current standards and codes for infrastructure in India are lagging behind in quality & coverage, as compared to the international codes. They do not represent the scientific and technological developments that has taken place over last 3 or 4 decades. As an example :
   a. Foundation Codes – We still follow WS approach.
   b. Performance Based Design Concepts are still not introduced in our codes
   c. Use of Dampers and Base Isolation for Seismic Design – Still to be introduced in our codes
   d. Sustainability & Climate change concepts – not embedded in our codes yet. Structural Engineers have a major role to play in sustainable development of the society.

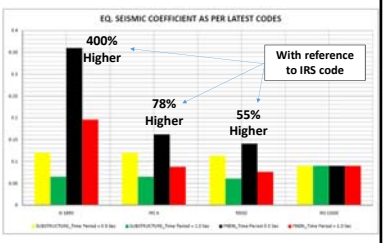
STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

2. Code development process in India needs significant improvement. Pace with which the codal amendments are brought about is rather too slow. By the time amendments / revisions are published, the code is outdated.

   As an example :
   a. IRC:45:1972 – Neither withdrawn nor revised since 1972 !
   b. IRC:SP:40:1990 – 28 years since last revision !
   c. IS:1893 (Part 1):2016 - Revised after 14 years !
   d. IS:1893 (Part 5) - Declared in 2002 but yet to see the light of the Day!
   e. IS:456-2000 – 18 years passed without any revision!!

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

3. There are too many institutions responsible for developing codes. (e,g. BIS, IRC, IRS, RDSO). There is little synchronization between these agencies, which results in duplicity of work, conflicts in the codal clauses.



Comparison of Seismic Coeff. (Eq.) as per 4 Indian codes

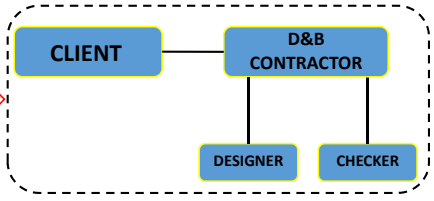
STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

4. Codes are becoming more and more voluminous and complicated. There is a need to make the codes more user friendly, to the extent possible.
5. Codes should be supplemented by Designer's Guides, Explanatory Handbooks, User Manuals, Worked Examples …etc. Professional associations (like IAStructE, ICI, ACCE, CEAI, INSDAG …etc.) or Reputed Consultants may be engaged by the Code making bodies in preparing such manuals for the users.

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

6. One of the method usually adopted for Code Compliance in infrastructure project is to carry out third party proof checking.

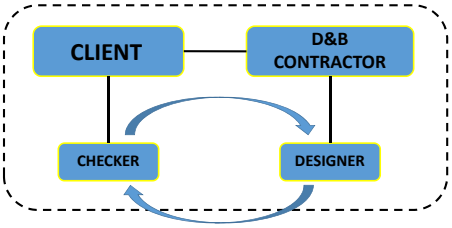
Flawed Model of Proof Checking in practice for EPC & HAM contracts



Contractor can influence the Proof Checker who will not have freedom to express his views without fear.

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

CONTRACTUAL ARRANGEMENTS



Better Contractual Model for Proof Checking

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

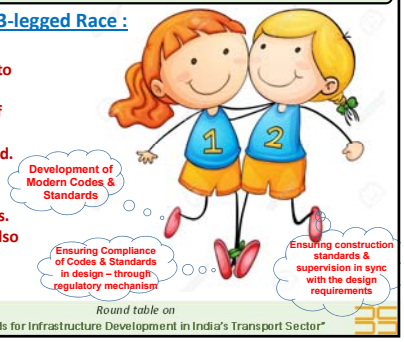
7. Code development requires best talent from practitioners, academicians, manufacturers, contractors, and other stakeholders. The code is developed through consensus. Being a voluntary work, it becomes difficult to attract talented people. Even when talented people join the committee, they do not devote quality time & attention that is required to be devoted for code development. This is reflected in the quality of the document.
8. Unlike many International Codes, most Indian Codes do not have the Commentary. Commentary helps in correct use of the code and can help avoid its misinterpretation / abuse.

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

9. The applicability of the codes & standards rests on following assumptions :
   a. The choice of structural system and the design of the structures are made by appropriately qualified and experienced personnel.
   b. Execution is carried out by persons having appropriate qualification, skill and experience.
   c. Adequate supervison and quality control are provided during all stages of design and construction.
   d. Construction Materials and products are provided and used as specified by national standards.
   e. The intended levels of properties of material adopted in the design are available.
   f. The structure is used as intended and is maintained adequately.

STATUS OF INDIAN CODES & CODE COMPLIANCE ISSUES .....

10. Code Compliance is like a 3-legged Race :
    - Developing good standards alone will not be sufficient to achieve this objective.
    - Effective implementation of the codes and standards in practice needs to be ensured.
    - Also construction needs to follow strictly the specifications and standards.
    - The structure needs to be also maintained periodically during it's service life.



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TECHNO – LEGAL – REGIME .....

1. There is a drive to create quality infrastructure in the country.
2. Focus needs to be on road sector. 65% of freight and 80% of passenger traffic is carried by roads. NH constitutes only 2% of the road network.
3. There is a steep increase in private sector investment in infrastructure. This calls for an urgent need for Regulation in this sector.

TECHNO – LEGAL – REGIME .....

Sector	Relevant Statutes	Regulatory Authority
Roads	National Highways Act of India, 1998 - Central Road Fund Act, 2000 - The Control of National Highways (Land and Traffic) Act, 2002	No regulatory authority. NHAI acts as the regulator as well as the operator. States have floated their own corporations or agencies. Investors have no recourse to an independent regulator

TECHNO – LEGAL – REGIME .....

Need for having an Independent Infrastructure Regulator arises from :

1. Large size of projects with Higher level of private participation
2. Sustainability and Environmental Considerations
3. Enforcing minimum service standards
4. Consumer Protection
5. To address social risk, market failure or equity concerns

TECHNO – LEGAL – REGIME .....

ACTIONS REQUIRED TO BE TAKEN WITH RESPECT TO CODES & STANDARDS ARE :

1. Upgrading our codes and standards to be at par with the International standards.
2. Improving the workmanship at site of works by preparing manuals for safe construction of new structures.
3. Introducing regulatory and enforcement mechanism to ensure that competent persons are involved in design and checking
4. Human resource development (Education, Training, R&D, Capacity Building and Documentation)

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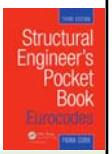
THE WAY FORWARD.....

1. Upgradation of Codes and Standards to International Standards shall be taken up on top priority.
2. All institutions involved in code making (BIS, IRC, IRS, RDSO) should join hands to ensure uniformity, consistency and also avoid duplication. (As an example : There should be only one national code for earthquake resistant design).
3. Code making process is a high-skilled and time consuming job. Present practice is to have committee members, who work voluntarily. Experts involved in code development must be paid for the time spent. This will ensure some accountability from the code making team.

THE WAY FORWARD.....

4. Every code should have a commentary to facilitate correct interpretation of the codal clauses. Work Manuals and Explanatory Handbook should also be available for important codes. Professional associations (e,g. IAStructE, ISSE, ACCE(I), ICI) may be involved in development of these manuals. Reference can be made to body of materials available after Eurocodes were published.



THE WAY FORWARD.....

5. Proof Consultants engaged in the projects should be competent. Practice of involving academic institutions for proof checking has not proved successful in the past and it only gives a false assurance on quality. Besides, the academic institutions should devote more time on CEP, human resource development and students programmes.
6. Practice of appointing proof checking consultant through the contracting agency is flawed. Proof Consultant shall be appointed by Client.

THE WAY FORWARD…….

7. Improving our codes & standards and ensuring compliance on a large scale requires :
   - Sustained attention and tremendous effort on multiple fronts by a diverse set of stakeholders over a long period of time.
8. A lot has been achieved in recent years But, much remains to be done

National Institute of Public Finance and Policy
Round table on "Standards for Infrastructure Development in India's Transport Sector"