

Group A-Conceptual Framework

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Definition: An acceptable definition of Performance Based Design (PBD) is considered to be "design/construction/engineering of buildings to achieve specified performance objectives." PBD provides the ability to achieve a selected level of performance. It is necessary for the owner and designer to clearly identify the performance objectives.

PBD requires greater involvement of owners and inhabitants. For them to understand and contribute effectively, language and terminology must be clear to all.

1. Terminology

Basic terminology for PBD must be commonly understood by all stakeholders, to conform with the regulatory framework, and to be as consistent as possible in the global community.

Recommendations

Form a group of representative stakeholders (e.g., engineers, regulators, owners, the public, ...) to:

- a) Propose mutually agreeable terminology to define performance in terms of expectations and technology,
- b) Develop educational materials relative to the PBD concepts,
- c) Facilitate education among the various stakeholder groups.

Development of terminology should:

- a) Be as clear as possible,
- b) Aim to minimize ambiguity, and
- c) Consider issues of translation into multiple languages

2. Separation of Policy and Technical Perspectives

a. The policy framework for minimum health and safety requirements for buildings is the building regulatory system. This system is ultimately within the accountability framework of governments. It is within this framework that societal expectations for minimum performance are established. Governments are moving increasingly to express these minimums in objectives or performance-based terms

b. The structural engineering community must provide leadership in the development of tools and methodologies to meet the performance objectives.

c. Meeting minimum performance as required through government policy does not in itself result in buildings meeting all client needs. Expectation beyond minimums should be expressed in performance terms to enable common tools and methodologies.

3. Distinction between Building Codes and Standards

Regulations are the legal framework by which building codes are adopted.

Regulators perception – Building codes provide a minimum level of safety and amenity consistent with public expectations.

Public expectations of regulations – they provide the framework to assure the public that their expectations of safety and amenity are met.

Building codes provide the framework by which building performance objectives are met.

Building Standards

One technical means of compliance with the performance expectations.

They are acceptance consensus solution of engineering expertise.

Standards provide the basis upon which engineering decisions can be made.

4. Complex Standards versus Simple Tools

If PBD is the engineering of buildings to achieve specific performance objectives, then we need to provide the engineering practitioners with appropriate tools to do their job.

These tools can be divided into two categories:

a. First Principles; b. Standardized Design Procedures.

If the criteria is defined, either set of tools can be used to demonstrate that the given design solution would be acceptable. The initial development of these tools will generally be in the first category, but for maximum effectiveness, they need to be evolved into category b. We recognize that most engineers will only use tools in category b. In PBD, key feature is the availability of options for design, so both are needed. In either case, we will need to have clear guidance on the scope of application and limitations of each tool regardless of category. In all of this, the importance of engineering judgment cannot be overstated.

5. Construction Quality Assurance (In-Service Evaluations)

This is the weakest link in building construction because it all comes together at the construction site.

What needs to be done?

Effective enforcement of design at the job site that can be achieved by special site inspections, and by monitoring the construction process

Issues

Guidelines must be developed for effective enforcement and inspection.

More emphasis must be stated for construction quality assurance.

Performance objectives must be stated for Construction Quality Assurance.

Compliance of construction to design must be studied to identify potential weaknesses and their consequence.

6. Harmonious Criteria

Clients express their needs in common language to engineers, i.e.

- a) Prevention of uncomfortable floor vibrations;
- b) No structural damage, continuous function or operation during extreme events;
- c) No perception of vibration in case of strong winds;
- d) Fire Safety.

It is extremely difficult for engineers to satisfy the client's expectations.

Engineers design structures according to target performance in engineering criteria, i.e.

- a) Criteria of Frequency of vibration and maximum amplitude;
- b) Increase importance factor. Adoption of base isolation to reduce maximum acceleration to target value (e.g. 0.2g);
- c) Restrict amplitude caused by wind of XX years return period to target value;
- d) No collapse by design fire load and duration.