Group B-Loads and Responses

Date: November 14 and 15, 2000
Place: Tsukuba International Congress Center
Chairpersons: I. Sakamoto and J. Barrett
Secretaries: N. Kawai, Y Okuda and N. Yamaguchi
Members: See Attachment Participants List Group B: Loads and Responses

Summary of Group Discussion

1. Individual papers were presented and the authors responded to specific questions raised by the group participants.
2. Group B participants met to discuss the draft recommendations and research needs report considering the intermediate summary reports presented by Groups A and C on Tuesday afternoon session.
3. Group B participants reviewed and expanded the draft summary of future research needs. New items added by individual members were discussed and approved by all Group B participants to arrive at the final set of recommendations to be submitted for the Final Presentation and Group Session.

Some of the main points of discussion related to establishing the final draft recommendations were as follows:

1. The Group discussed the need to extend the concept of the serviceability limit state in ISO 2394 to include reparability of other related "limit states". The umbrella limit states in a repair or remodeling context will still be strength and serviceability limit states.

2. Group members recognized that reliability assessment is an integral part of probability based design and that the setting of target reliability levels will still require engineering judgement.

3. The Group recognized the importance of establishing standard methods of inspection and assessment of buildings after disasters. A goal is to establish the basis for quantifying causes of damage or collapse of buildings in order to provide input for future revisions of design codes for loads, identification of limit states and design of future analytical and experimental research programs.

4. Research related to wind loads must consider the topography effects in urban and rural environments. For example, local topographic effects damage houses, high-rise buildings and transmission towers.

5. Load combination factors for live loads are based on limited material and limited types of buildings. The load combination factors may be a major area of uncertainty. Currently, there is a very limited amount of research underway on the actual live loads and the load combination rules. What is the live load for ultimate limit states, the extraordinary live load?

6. Much of our understanding of building performance is based on behavior of individual buildings or structures. Often the problems related to damage of structures due to interference of adjacent buildings are poorly understood. More research on the impact of adjacent buildings on the damage of structures is required.

7. Group members recognized that execution of benchmark designs internationally would be very useful. Understanding the differences in design solutions provided by "national" criteria will provide importance insights into areas for future analytical, experimental and building code development needs.

8. The Group recognized the needs for greater and more effective participation of practitioners, users and product producers in the code development and implementation process.

Recommendations

These recommendations summarize and priorize the most important results of the discussions held within Group B. Group B recognizes that there are many challenges to be overcome in our understanding the loads and responses in order to develop and implement the advanced Probability Based Design methods needed to provide building owners and users with the building that meet target performance levels.

As a fundamental precept we believe the rationale path to solving these problems lies in advancing the development of advanced structural performance models – confirmed by tests – that will serve as the basis for predicting the structural response of building elements, systems and complete structures under random loads and variable material response.

The key recommendations from Group B are as follows:

1. Advance our understanding of the loads and load combinations required for advanced structural analysis as required for PDB of buildings.
2. Develop advanced dynamic analysis techniques to study the dynamic behavior of buildings and soil structure interactions.
3. Couple advanced analysis techniques with reliability analysis methods to develop probability based design methods and simplified design procedures suitable for implementation in future design codes.
4. Increase efforts to identify the level of damage in relation to specific limit states using a performance based design framework.
5. Encourage international cooperation through networks, exchanges of researchers and practitioners and the development of databases and sharing of analysis tools to stimulate the rapid development and implementation performance based building codes.