Communique from ATC-15-17 Workshop

In December 2024, established not-for-profit structural engineering organizations from the U.S.A., Japan, and New Zealand (the Applied Technology Council (ATC), Japan Structural Consultants Association (JSCA), and New Zealand Society for Earthquake Engineering (NZSEE), respectively) hosted an international workshop with over 50 international engineering experts to present their latest work with a goal towards improving post-earthquake recovery of the built environment in support of overall community resilience. Workshop presentations, papers published in the ATC-15-17 Proceedings Document (ATC, 2025), and collaborative discussions during the event identified a number of common themes listed below to support post-earthquake recovery and resilience at the community level.

Current building codes aim at life safety performance objectives, but do not adequately address the need to reoccupy structures quickly to enable fast recovery to support community resilience. In this regard, modifications or additions to design approaches are needed with urgency for new and existing buildings, as well as infrastructure.

1. **Reducing seismic deformations** was mentioned repeatedly as one of the first measures that should be implemented to reduce structural and nonstructural damage, make repairs feasible, and hence facilitate ongoing functionality. Reducing drift to control damage has helped Japanese buildings to quickly recover to provide functionality.
2. In the U.S. and New Zealand, development of performance objectives and design guidance for **recovery-based design** are under development. It is noted that the countries have slightly different approaches with the U.S. efforts focusing on quantification of functional recovery time and the New Zealand efforts focusing on damage control through structural design. Implementation of recovery-based codes, standards, and other programs should consider functionality and economic consequences in terms of business disruption, life-cycle costs, carbon emissions, as well as long-term costs of doing nothing in addition to considering initial cost of construction.
3. Performance of nonstructural components has a major impact on repairability and functionality of buildings following an earthquake. There was agreement that there is a need for global collaboration for the development of **new generation of**

nonstructural component technologies that can accommodate earthquake demands as well as improved information collection for use in analyzing existing components.

4. When properly implemented, current safety-based building codes and related structural design standards generally use the concept of ductility to safely resist and dissipate the energy of earthquakes, but this approach inherently involves damage occurring to structural and nonstructural systems and components that must be repaired prior to achieving post-earthquake reoccupancy and functional recovery. The following actions can **enable repairability through recovery-based design**:
    a. Coordination among the entire building team for inspections and repair, availability of relevant building drawings and structural models, and inclusion of access panels and relevant instructions can assist with observing damage and repair of vulnerable structural and nonstructural components.
    b. Implementation of methods described in FEMA P-2335, a recently published U.S. methodology for inspection and repair of structures.
    c. Study of field observations from sequence of earthquakes, e.g., Kumamoto earthquakes in Japan, can improve the understanding of the effect of multiple earthquakes.
    d. Consideration of applicability and feasibility of new inspection technologies, e.g., unmanned drones, LiDar scans, should be included. Additionally, structural health monitoring during normal excitations, e.g., wind and traffic, can help identify components more likely to be damaged in an earthquake.
5. Lastly, several aspects of **outreach and education** were discussed:
    a. Early integrated focus on building form by a broad range of engineers and professionals is needed to achieve cost effective decarbonization and resilience.
    b. Frequent earthquakes (as in Japan) keep earthquake risks top of mind. For other countries with less frequent earthquakes (U.S. and NZ), it will be important to keep policies/tools "ready to go" when there is public demand.
    c. Availability of simpler methods for analysis and design can enhance design quality.