Briefing Paper 2

Roles and Responsibilities of Engineers, Architects, and Code Enforcement Officials

Part A: The Need for Improved Coordination

Introduction

This Briefing Paper 2, *Roles and Responsibilities of Engineers, Architects, and Code Enforcement Officials,* addresses the need for improved coordination in the seismic design and construction process. Divided into two parts, this Briefing Paper focuses primarily on issues relating to the seismic resistant design and installation of nonstructural components, an area where coordination has been particularly lacking. This Part A provides an overview of why this topic is essential for the reduction of earthquake losses. In particular, it discusses how roles and responsibilities are changing and how these changes can affect quality control and the seismic resistance of specific nonstructural components. Part B identifies the major issues raised at the 1999 ATC/SEAOC Joint Venture Workshop on Roles and Responsibilities, which is introduced in Part A, and provides recommendations to resolve three key issues identified at the workshop. The goal of Briefing Paper 2 is the improvement of overall construction quality, particularly the seismic performance of nonstructural components and complete nonstructural systems.

Engineers, architects, and code enforcement professionals have substantially different viewpoints about thier own roles and responsibilities, and the responsibilities of others, for ensuring adherence to seismic provisions in the design and construction process.

Workshop on Roles and Responsibilities

The impetus for holding the 1999 Workshop on Roles and Responsibilities originated from a review of responses to an eight-page survey sent by the ATC/SEAOC Joint Venture to ATC subscribers and to members of the California Council of the American Institute of Architects, California Building Officials, the Structural Engineers Association of California, and two organizations of special inspection and testing agencies in the San Francisco and Los Angeles areas. These groups are the target audience of the California Seismic Safety Commission's project on the continuing education of design and code enforcement professionals. It was apparent from the survey responses that these groups have substantially different viewpoints about their own roles and responsibilities, and the responsibilities of others, for ensuring adherence to seismic provisions in the design and construction process.

The 1999 workshop focused on the installation of nonstructural building components and systems that are typically not the direct responsibility of the architect or engineer of record. The workshop purpose was to explore how the division of roles and responsibilities among members of the design, code enforcement and construction elements of building projects affects the seismic performance of nonstructural building components. The workshop's 24 participants included architects, local and state agency building officials, plan-check engineers and inspectors, general and specialty contractors, and structural and mechanical design engineers.

The workshop also provided a forum for representatives of these various groups to discuss problem areas or impediments to construction quality and the provision of adequate seismic resistance in both new construction and retrofit projects. The goal was to define the principal problems, to recommend methods to solve them, and to make the workshop results available to all affected professions (through this briefing paper and by other means).

During the workshop it was noted that a significant portion of injuries, and often more than one-half of the total economic loss in earthquakes, stems from damage to nonstructural building components (Figures 1 and 2). Economic losses are rarely limited to the cost of repairing individual damaged components. Losses often include collateral damage to other related equipment and to building contents and the indirect costs associated with the time necessary to complete repairs. In fact, the costs associated with nonstructural component damage can be two to three times the cost of repairing structural damage caused by earthquakes. As a result, specific responsibility for the seismic performance of all building components and systems must be clearly established and understood by those designing their installation, and by those performing the actual installation and inspection. Please refer to Briefing Paper 5 (in this series), *Seismic Response of Nonstructural Building Components*, for a more detailed discussion of nonstructural component vulnerability and proper seismic restraint of these components.

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Figure 1. Earthquake Induced Partition Damage. Earthquake Engineering Research Institute photo.

Design-Build and Fast-Track Projects

The current prevalence of design-build and fast track project design and construction has increased both the complexity and the importance of coordination and communication among all of the entities involved. The organization of project teams, the financial accountability, and increasing owner involvement in choosing design consultants and contractors, are all changing traditional roles and responsibilities. At the same time, the nature and level of involvement or oversight by the primary designers with respect to nonstructural components appears to be diminishing. Specialty contractors are regularly delegated the design, fabrication, and installation responsibility for nonstructural components (e.g., window walls, cladding, veneers, fire protection systems) whose seismic performance is critical to both occupant safety and postearthquake functionality. These contractors and mechanical and electrical system design engineers may be given contractual responsibility for seismic performance of the components and systems they specify or install, but they may not have sufficient knowledge or experience to execute that responsibility without assistance from the structural engineer.

The architect has traditionally held the responsibility for the overall project coordination, including discussions with the client,

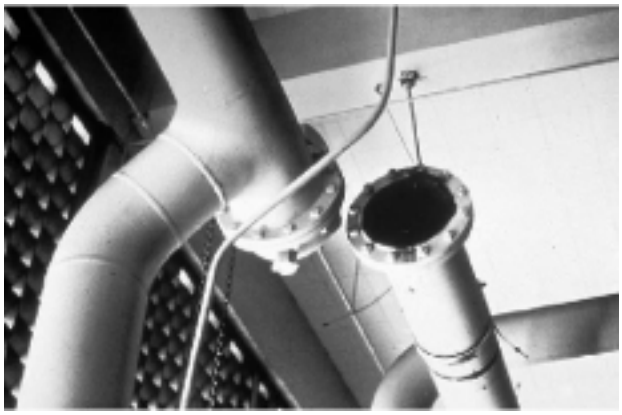

Figure 2. Earthquake-induced pipe damage. Earthquake Engineering Research Institute photo.

negotiating contracts with other design consultants and paying for their services, writing specifications for all elements of the construction, and dividing roles and responsibilities among members of the design team. With these financial and procedural arrangements, the architect had the ability to control the quality of the finished product. Design-build projects usually have different financial arrangements, in which the general contractor may hire some of the design consultants or the owner may desire to select consultants. In fact, the contractor may have principal control of certain design processes, role definition, schedule, and finances. Such arrangements significantly alter accountability, division of responsibilities, and lines of communication, placing the architect in a noticeably less dominant role without necessarily reducing the owner's perception of the architect's span of control. In some cases, the architect is obligated for reasons of liability to abdicate responsibilities under these arrangements. However, the result may be that no one takes responsibility for the necessary coordination. This situation increases the potential that the seismic performance of nonstructural building components will not be adequately addressed.

Almost all nonresidential projects are now considered "fast-track" with multiple subdivisions of a single building project into distinct submittal packages. The current trend goes far beyond the common practice of separating the building shell from the tenant improvements. While a fast-track process can speed a project's completion, it substantially complicates coordination because a complete design team is usually not established before drawings and documents are started. This arrangement can cause problems when decisions early in a project delegate responsibility to entities who are not yet under contract and who may not expect to be given that responsibility. Failure to involve subcontractors or design consultants early in a project's development can result in expensive revisions to previous design or fabrication work. Adequate communication among designers during fast-track projects is difficult to achieve because work needing coordination is often occurring in different time frames. The deferred submittals used to postpone detailed descriptions of some components or products until suppliers have been selected also create difficulties for building department plan-checking and inspection efforts.

Deferred Submittals

Most product delivery methods incorporate a commonly used process defined in the building code as a "deferred submittal." Typically, contract documents for the stairs, elevators, exterior cladding, window walls, and sometimes the entire mechanical or electrical systems serving tenant spaces, are not provided with the application for the building permit. The code does allow this to occur, and since its 1994 edition, the *Uniform Building Code* (UBC) has contained specific rules for the review of deferred submittal items. The UBC requires all deferred submittal items to be listed on the plans and that the architect or engineer of record review and accept all deferred submittal documents prior to forwarding them to the building department for review and approval. However, in practice, the design and fabrication or shop drawings for these items are not always thoroughly reviewed by the architect or engineer, and sometimes are never submitted to the building department. Assigning and completing the responsibility for the review of these items by both the building designer and the code enforcement officials is crucial for ensuring that these components can adequately withstand earthquake forces.

A common deferred responsibility is the seismic

anchorage of mechanical equipment to the building's structural framing. In a typical situation, the mechanical designers or contractors may expect the structural engineer to accommodate them with specifically designed parts of that anchorage. The structural engineer, on the other hand, may believe that this is outside the engineer's responsibility, because specific information to accomplish the task was not available during the structural design phase, or it was not included in the contract. When responsibility is not assigned to the consultant best able to address the issue, and no provision is made for a review of the anchorage by that individual, improper anchorage and resulting earthquake damage can occur. Building departments usually, but not always, require the submittal of design and construction documents for equipment anchorage. If the anchorage is designed by a person unfamiliar with seismic design principles and not reviewed at all, or only reviewed by someone who is likewise insufficiently knowledgeable, the equipment may be at great risk of earthquake damage. The substantial changes in the 1997 UBC for calculating nonstructural component seismic design forces and calculating the much larger anchorage forces that apply to roof-mounted equipment will undoubtedly increase the unintentional noncompliance with code requirements. Similar situations of inadequate design or design review also occur for other nonstructural components, even those that are not part of deferred submittals.

When responsibility is not assigned to the consultant best able to address the issue, and no provision is made for a review of the anchorage by that individual, improper anchorage and resulting earthquake damage can occur.

References

ICBO, 1997, *Uniform Building Code*, International Conference of Building Officials, Whttier, California.

About this Briefing Paper Series

Briefing papers in this series are concise, easy-to-read summary overviews of important issues and topics that facilitate the improvement of earthquake-resistant building design and construction quality.

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