

## Description of Work

### *ASSESS PAST PERFORMANCE OF STEEL BUILDINGS*

#### **Subtask 3.1.5 Investigate Damage to Welded Steel Moment Frame Buildings in Earthquakes other than Northridge**

**Background:** It is the purpose of Task 3.1.5 to identify and document specific cases where damage to welded steel moment frame (WSMF) buildings that have occurred in past US earthquakes. This task is part of Task 3, whose goal is to document and assess the performance of WSMF buildings in past earthquakes and to provide means for evaluate and predict impacts in future earthquakes.

During SAC Phase 1, an extensive data base was developed that characterized the specific inspection results of buildings, focusing on damaged buildings. It was exploratory in nature and thereby incomplete for analysis purposes. Task 3 of SAC Phase 2 will supplement, and in some cases replace, this data set to provide statistically consistent, reliably characterized data that will allow the formulation of predictive models for damageability and economic impact for specific buildings and groups of buildings, evaluation of the efficacy of current procedures for the inspection and evaluation of building conditions, based on Chapter 3 and 4 of the 1995 SAC Guidelines, and assessment of the impacts on the provision of repair related services within a community. The task will collect five distinct types of data: 1) general data for all of the buildings subject to the Los Angeles Municipal inspection ordinance; 2) specific engineering data for selected buildings that is as complete as practical; 3) data addressing the nature and reliability of the inspection process; 4) identification and documentation of damage to WSMF connections in other earthquakes; and, 5) documentation and characterization of the impacts of WSMF damage on selected construction service providers, financial institutions, and regulatory agencies.

The objective of Task 3.1.5 is to discover and document whether WSMF buildings have been damaged in other earthquakes and locations. It is intended to present anecdotal data that is complete enough to convince designers, regulators, and contractors that the problems observed in WSMF performance in the Northridge earthquake were not due to peculiarities in local practices or the specific characteristics of this earthquake.

#### **Objectives**

*Objective 1:* Participate in the overall conduct of the Task as a member of the team on Past Performance of Steel Buildings in Earthquakes. Participate in the formulation of the Task work plan, and contribute to the determination of what questions are to be answered in subsequent Task 3 efforts using the information gathered by Task 3.1 efforts. The investigators will make themselves available for participation in Task 3.2, which will use the data and information collected to formulate impact models and assessment procedures.

*Objective 2:* Attend project team meetings. Review and comment on material prepared by other SAC task team members, responding to review comments in a timely manner. Each task will draw information from, and provide information to each of the other efforts under Task 3.1 as well as other activities outside of the Past Performance area.

*Objective 3:* Prepare written documentation of investigation methods and detailed findings for incorporation into the Task report; incorporate review comments from others as appropriate. Provide timely review of summary Task documents that describe and include results, data, and findings from the work completed under this sub-task. Fully document data collected by providing copies of all interview and record forms, and provide SAC with copies of all computer files and data bases developed. Where so committed to the providers, all data collected will be kept confidential in line with the practice established in SAC Phase 1.

*Objective 4:* Prepare a format for data acquisition to facilitate the collection of meaningful data with building anonymity. Submit to project team and Project Director for Topical Investigations for review and approval. Incorporate comments and finalize.

*Objective 5:* Develop/update a letter of confidentiality that documents SAC's commitment to keep all confidential information strictly confidential. This agreement will be signed by SAC representative and executed by the building owner.

*Objective 6:* Arrange data for Peninsula building damaged during the Loma Prieta earthquake in accepted format. Meet with building owner and present formatted data and letter of confidentiality. Seek approval to publish data.

*Objective 7:* Identify and meet with representative for East Bay building damaged during the Loma Prieta earthquake. Seek approval to collect and disseminate data in standard format. Provide assistance in gathering data as needed.

*Objective 8:* Identify and meet with representative of buildings believed to have been damaged as a result of the Landers/Big Bear Earthquake. Seek approval to collect and disseminate data in standard format. Provide assistance as needed in gathering data.

*Objective 9:* Identify and meet with representative of building believed to have been damaged as a result of the Whittier earthquake. Seek approval to gather information in standard format. Provide assistance as needed.

*Objective 10:* Interview targeted engineering offices and testing agencies in an attempt to locate additional buildings that may have been damaged by earthquakes other than Northridge. Also, investigate the number of buildings that have been subjected to post-Northridge inspections and found to be undamaged.

*Objective 11:* Follow-up on leads from interviews. Assume 2 visits to building departments and 2 visits to building owners.

**Deliverables:** The primary products of this investigation will be the collected data and associated interpretations, synthesized in a final report. All interview and record forms, and building damage

data, as well as all computerized catalogs and databases shall be made available to SAC at the time the draft report is submitted. Any computerized information should be in a format which can be converted to on-line format for distribution on the World Wide Web. The confidentiality of all such information will be maintained in accordance with procedures adopted in Phase 1 of the SAC project. The final report shall summarize significant findings of the data collection and evaluation process, as well as identifying additional issues which may be addressed in follow-up studies under Task 3.2. Significant results of this study will also be incorporated into the State-of-the-Art Report on the Performance of Steel Buildings in Past Earthquakes. Interim reports will be required to update the Task Coordinator and SAC management on progress.

**Task Management and Review:** This subtask is supervised by James Malley, Project Director for Topical Investigations. The members of the team investigating the Performance of Steel Buildings in Past Earthquakes will provide oversight and an advisory role on the conduct of the research and will review, provide specific comments and evaluate all reports and recommendations. Team Leaders and selected members of the Joining and Inspection TAP, the Connection Performance TAP, the System Performance TAP, the Performance Prediction and Evaluation TAP, and the Social, Economic, and Policy Panel (SEPP) will also review and evaluate this work. It is expected that the subcontractor/consultant selected for this subtask will be responsive to issues and concerns raised by the Project Director, the Task Coordinator for Performance of Steel Buildings in Past Earthquakes, and other reviewers. The subcontractor shall be responsible for regularly reporting progress and difficulties to the Past Performance Task Coordinator and the Project Director for Topical Investigations.

**Target Audience:** The work products of this subtask will be directly used by the Performance Prediction and Evaluation Team, the SEPP, and the guideline writers working on the SAC Phase 2 project. There will also be a need to integrate these results with the various other investigations throughout the progress of the program. They will also be of interest to Topical Investigation Team Leaders for Joining and Inspection, System Performance and Connection Performance. The results of this sub-task will be used to develop the State of the Art Report on Performance of Steel Buildings in Past Earthquakes. It is expected that the results will also be of great interest to the general profession and research community.