

SEISMIC RESTRAINT MANUAL

GUIDELINES FOR MECHANICAL SYSTEMS

OSHPD Edition

April, 2009



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'
NATIONAL ASSOCIATION, INC.**
www.smacna.org

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FOREWORD

History of the Guidelines

During the San Fernando Earthquake of 1971, four of the eleven medical facilities in the area were so badly damaged that they had to be evacuated. As a result, the State of California began to require that hospitals be built to remain operational after an earthquake. Part of this mandate required stabilizing the mechanical and piping systems.

To provide technical guidance for economical bracing methods, the Sheet Metal Industry Fund of Los Angeles published *Guidelines for Seismic Restraint of Mechanical Systems* in 1976. This document was pre-approved by the California Office of Statewide Health Planning and Development (OSHPD). A later edition, in 1982, co-published by the Plumbing and Piping Industry Council, Inc. (PPIC), expanded the bracing guidelines for piping. For several years, these were the only available guidelines, and they were used nationwide even though they had been designed for California's unusually severe seismic conditions. The result was that, in many parts of the country, seismic restraints were being over-designed at unnecessary expense.

To remedy this, SMACNA formed the Seismic Restraint Task Force to study the feasibility of developing national standards. In April 1990, the task force recommended that SMACNA develop and publish a manual of seismic restraint guidelines. It was to include non-technical explanations of seismic forces, and the tables from the old guidelines would be expanded to include electrical conduit and larger ducts. Then, for about a year, the manual was developed by the task force and consulting engineers, with input from a broad spectrum of users in the sheet metal and plumbing industries.

This special edition of the SMACNA *Seismic Restraint Manual* has been developed to meet the specific requirements of OSHPD for hospital and health care facilities construction. The seismic hazard tables are limited to the two (2) applicable to these facilities and the text outlines the submission process for the use of the manual.

Purpose of the Guidelines

In the past, design for protection against earthquake damage was confined primarily to the structural systems of buildings. However, even in buildings that did not collapse, it was discovered that the destruction of nonstructural elements, such as heating ducts and gas pipes, could cause great damage to the building and even loss of life. Damage to the mechanical systems could mean that a building might be uninhabitable for weeks or months. As a result, seismic concerns now include restraints for ductwork and piping in buildings.

Roles of Construction Professionals

In order to accommodate a variety of conditions, these guidelines are somewhat more complicated than the original manual. It now takes more than a simple cookbook procedure to determine the proper restraints. One step in the restraint design process, determining the proper Seismic Hazard Level (SHL), requires professional judgment and direction from the Engineer of Record. A sheet metal or plumbing contractor cannot be expected to carry the burden of this judgment. Rather, the Engineer or Architect of Record must take responsibility for determining the SHL. Conditions not covered in this manual are the responsibility of the design professional.

What Is Not in This Manual

This manual is not intended to cover the ordinary supports for ducts and pipes required for gravity loads. (Some have been included for reference only.) The only restraints shown in these tables and drawings are those needed to provide the extra support for seismic loads.

For consultation on seismic applications or conditions not covered by this manual, the reader may contact John A. Martin & Associates at 213-483-6490. This service should not be considered to be available on a gratis basis.

This manual also does not cover the seismic restraints for fire sprinklers and equipment. Fire sprinklers have been covered by the National Fire Protection Association (NFPA) since 1939.

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