SEISMIC RESTRAINT MANUAL

GUIDELINES FOR MECHANICAL SYSTEMS

ANSI/SMACNA 001-2008

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

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THIRD EDITION – MARCH, 2008

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Printed in the U.S.A.

FIRST EDITION – DECEMBER 1991
SECOND EDITION – FEBRUARY 1998
THIRD EDITION – MARCH 2008

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 this 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 third edition has been revised to conform to the requirements in the International Building Code 2006. The application tables have been revised and a fourth table added to provide bracing provisions for four different levels of anticipated force levels. Appendix A is provided to assist the design professional in the specification/selection of the bracing levels required.

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.

Also in recent years, there has been growing concern about the possibility of earthquakes in parts of the country that are not usually thought of as "earthquake zones." Areas of the South and Midwest, for example, are beginning to take precautions because of the dangerous consequences to life and property in case an earthquake does occur. Since 1988, all the major national building codes have required bracing for pipes and ducts. As engineers and builders in these areas look for guidance in making buildings safer, they naturally turn to California, with its longer history of designing for earthquakes. However, because California has such severe, frequent earthquakes, its standards may be too strict for other parts of the country.

Until now, designers have had little choice but to use California's strict guidelines or use none at all. The purpose of this manual is to provide a flexible set of guidelines that accommodates all parts of the country. Within a single format, very low-risk and very high-risk areas can be easily and equally accommodated. The guidelines will enable designers and contractors to determine the regionally-appropriate restraints for sheet metal ducts, piping, and conduit, so that they are more likely to maintain their integrity and remain attached to the building's structure during an earthquake.

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 con-

sultation with local jurisdictions. A sheet metal or mechanical contractor cannot be expected to carry the burden of this judgment. Rather, the design professional 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.

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.

SHEET METAL AND AIR CONDITIONING CONTRACTORS'
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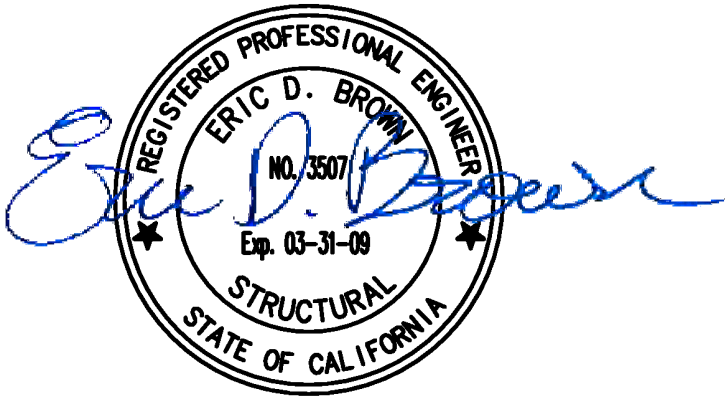

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TABLE OF CONTENTS