

# **RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS**

**Inch-Pound Version**



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'  
NATIONAL ASSOCIATION, INC.  
[www.smacna.org](http://www.smacna.org)**

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I-P SECOND EDITION — AUGUST, 2004



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'  
NATIONAL ASSOCIATION, INC.**  
4201 Lafayette Center Drive  
Chantilly, VA 20151-1209  
[www.smacna.org](http://www.smacna.org)

# **RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS**

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by

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

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## FOREWORD

These duct construction standards are intended for use by contractors, fabricators and designers of air pollution control, pneumatic conveyance and industrial ventilation systems.

The 1980 edition of these standards was the first publication dealing with the selection of duct gauge and reinforcement for rectangular industrial duct systems. While the first edition served industry very well for many years, technology has continued to evolve and in response to our membership's request, SMACNA's Rectangular Industrial Duct Construction Task Force led a comprehensive review and update of the first edition, resulting in this greatly expanded and more "user friendly" version of the original publication.

While the new text includes many of the same assumptions as the original work, a number of new features have been added:

- Six different types of carbon galvanized and aluminized steels
- Seven different types of stainless steel alloys
- Three different types of aluminum alloys
- Consideration of wind, snow, ice, and other loads
- Design check for localized and global modes of side panel buckling
- Design capability for high temperature systems up to 800 °F, and higher with design review by a specialized professional.
- New Chapter of practical examples with step-by-step instructions
- New Duct Class 5 – for systems handling corrosives
- Expanded data for the selection of duct supports, fasteners, gaskets and joint sealants
- Accepted Industry Practice for Rectangular Industrial Ducts
- New Chapter on Welding
- New Guide Specification for the fabrication and Installation of industrial duct systems

The Rectangular Industrial Duct Construction Task Force is deeply indebted to Doctor Michael C. Soteriades who did the original work for the first edition and contributed greatly to the improvements and expansion of the technical scope in the new edition. Likewise, the task force is deeply indebted to Joseph M Plecnik, PhD, P.E. of California State University at Long Beach, who is responsible for the physical testing, finite element analysis (FEA) studies, and design guidance related to the issue of Non-Linear Elastic Buckling of Duct Side Panels on Rectangular Industrial Duct.

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



## RECTANGULAR INDUSTRIAL TASK FORCE

Steven P. Graves, P.E., *Chairman*  
Du-Mont Company  
Peoria, IL

Mitchell Hoppe  
Melrose Metal Products, Inc.  
Fremont, CA

Blake L. Anderson, P.E.  
Climate Engineers, Inc.  
Cedar Rapids, IA

Ernest R. Menold, P.E.  
Ernest D. Menold, Inc.  
Lester, PA

John Gundlach  
McKinstry Company  
Seattle, WA

G. A. Navas, Staff Liaison  
SMACNA, Inc.  
Chantilly, VA

### CONSULTANTS

Douglas S. Barno  
DSB Marketing Group, N.A.  
Granville, Ohio

Simon J. Scott  
Scott Consulting Services, Inc.  
Westerville, Ohio

Joseph M. Plecnik, PhD, P.E.  
Cal State University, L.B.  
Long Beach, CA

Dr. Michael C. Soteriades  
Catholic University  
Washington, DC

### FORMER COMMITTEE MEMBERS AND OTHER CONTRIBUTORS

Harry Basore  
Kansas City, MO

Donald Partney  
Granite City, IL

Wallace E. Fizer  
Lexington, KY

Michael G. Poja  
Milwaukee, WI

William Harbaugh  
Houston, TX

Francis J. Walter  
Evansville, IN

Marvin Hicks  
Idaho Falls, Idaho

Harold Weisgerber  
Cincinnati, Ohio

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## **CHAPTER 1**

# **INTRODUCTION**

This is a preview of "SMACNA 1922-2004". [Click here to purchase the full version from the ANSI store.](#)

## 1.1 SCOPE

The scope of this manual includes the determination of the necessary construction details for the fabrication and installation of rectangular metallic industrial duct within the following general categories, and as further detailed in the scope of individual chapters, through a variety of both analytical and empirical methods:

- Fabricated from flat sheet or plate panels, using welded seam, grooved lockseam, Pittsburgh lock, and standing seam techniques.
- From commercial grades of carbon, galvanized, aluminized, or stainless steel, or aluminum of the various grades and types as described in Chapter 3.
- For a design pressure within the range from negative 150 in. wg to positive 150 in. wg.
- To be supported at intervals not exceeding 30 ft.
- For a design temperature not exceeding the specific operating limits listed for each type and grade of metal included in Chapter 3.
- With panel widths ( $W$ ) up to 12 ft.
- Listing of rated stiffeners, flanges, hanger and support elements, and the methods for selecting them for specific structural loads.
- An accepted industry practices for the fabrication and installation of rectangular metallic industrial duct, with its fittings, appurtenances, accessories, insulation, lagging, hangers and supports.

## 1.2 PURPOSE

There were three primary purposes behind the development of this manual:

- To develop minimum standards for the fabrication and installation of metallic rectangular industrial duct systems.
- To develop new, and collect existing, duct construction practices and data to serve as an authoritative source of accepted industrial practices for contractors, design engineers,

facility managers, and pollution control authorities.

- To provide an authoritative source of documentation and terminology for operations involved in the construction and installation of rectangular metallic industrial duct.

## 1.3 DEVELOPMENT OF THE SECOND EDITION

The objectives behind the development of this second edition of SMACNA's *Rectangular Industrial Duct Construction Standards* are to expand the scope of the first edition; update the theoretical basis for design; improve the presentation to make the expanded publication more "user friendly;" to cover both the simple, low or moderate temperature and pressure indoor systems, as well as the more complex outdoor systems, operating at moderate to high temperature and pressure, and subjected to higher and more complex external loading.

To achieve these objectives the following steps were taken:

- A professional review of the theoretical basis for the first edition was completed and an expansion of the examples to include both global and localized shear capacity of the side walls.
- Laboratory testing and data analysis on rectangular duct were completed to support the addition of a side wall shear capacity check to those already introduced in the first edition.
- Material previously covered in broad terms was expanded through in-depth coverage. New chapters were added covering such duct fabrication topics as Stiffeners, Flanges, and Fasteners; Hangers and Supports; Welding; Accepted Industrial Construction Practices; and a Guide Specification.
- To provide for the design process of duct systems from the very simple to the complex, while making the process "user friendly," the design or duct selection process was developed as a **Table Driven Process**.

## 1.4 INDUSTRIAL DUCT DESIGN

The approach, or avenue to rectangular industrial duct design is as described here:

