RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS

SI Version

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

RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS

SI SECOND EDITION – AUGUST 2007

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FIRST EDITION – 1980
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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 thickness 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:

- New SI version
- 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 427°C, 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.

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TABLE OF CONTENTS

FOREWORD iii

RECTANGULAR INDUSTRIAL TASK FORCE iv

FORMER COMMITTEE MEMBERS AND OTHER CONTRIBUTORS iv

NOTICE TO USERS OF THIS PUBLICATION v

TABLE OF CONTENTS vii

CHAPTER 1 INTRODUCTION **Page**

1.1 SCOPE 1.1
1.2 PURPOSE 1.1
1.3 DEVELOPMENT OF THE SECOND EDITION 1.1
1.4 INDUSTRIAL DUCT DESIGN 1.1
1.5 HOW TO USE THIS MANUAL 1.2
1.6 MANUAL CONTENTS 1.2

CHAPTER 2 INDUSTRIAL DUCT APPLICATIONS

2.1 INTRODUCTION 2.1
2.2 DEFINITION OF INDUSTRIAL DUCT 2.1
2.3 DUCT SYSTEM CLASSIFICATION 2.1
2.4 MATERIAL (PARTICULATE) CHARACTERISTICS AND CLASSES 2.2

CHAPTER 3 DUCT MATERIALS

3.1 INTRODUCTION 3.1
3.2 MATERIAL TYPES 3.1
3.3 CARBON AND COATED STEEL DATA 3.4
3.4 STAINLESS STEEL DATA 3.8
3.5 ALUMINUM DATA 3.12
3.6 MATERIAL PROPERTIES SUMMARY 3.14
3.7 CORROSION 3.15

CHAPTER 4 DESIGN CRITERIA

4.1 INTRODUCTION 4.1
4.2 GENERAL PROVISIONS 4.1
4.3 NOMENCLATURE 4.1
4.4 LOADS 4.3
4.5 LIMITS AND TOLERANCES 4.7
4.6 SERVICEABILITY AND DURABILITY 4.7
4.7 DESIGN OF DUCT THICKNESS 4.7
4.8 DESIGN OF STIFFENER SIZE 4.11
4.9 DESIGN OF SUPPORT SPACING 4.12
4.10 BOLTING OF CONNECTIONS 4.13
4.11 CHECKING SHEAR CAPACITY OF DUCT SIDE WALLS 4.16
4.12 CRITERIA FOR THE DESIGN OF SYSTEMS WITH INTERNAL SUPPORTS 4.21
4.13 HANGERS AND SUPPORTS 4.24
4.14 THERMAL EXPANSION 4.26

CHAPTER 5 DESIGN EXAMPLES **Page**

5.1 DESIGN EXAMPLES 5.1
5.2 SUBDIVIDING PANELS AND SELECTING INTERNAL SUPPORTS 5.30
EXAMPLE #5–1 . . . . . 5.2
EXAMPLE #5–2 . . . . . 5.5
EXAMPLE #5–3 . . . . . 5.7
EXAMPLE #5–4 . . . . . 5.12
EXAMPLE #5–5 . . . . . 5.15
EXAMPLE #5–6 . . . . . 5.21
EXAMPLE #5–7 . . . . . 5.25

CHAPTER 6 DUCT SELECTION TABLES — CARBON AND COATED STEELS

6.1 INTRODUCTION 6.1
6.2 SCOPE 6.1
6.3 MINIMUM MATERIAL MECHANICAL PROPERTIES 6.1
6.4 USE OF THE TABLES 6.1
6.5 DESIGN PROCESS 6.5
6.6 DUCT SELECTION TABLES 6.9
6.7 AUXILIARY TABLES 6.95

CHAPTER 7 DUCT SELECTION TABLES — STAINLESS STEEL

7.1 INTRODUCTION 7.1
7.2 SCOPE 7.1
7.3 MINIMUM MATERIAL MECHANICAL PROPERTIES 7.1
7.4 USE OF THE TABLES 7.1
7.5 DESIGN PROCESS 7.5
7.6 DUCT SELECTION TABLES 7.9
7.7 AUXILIARY TABLES 7.17

CHAPTER 8 DUCT SELECTION TABLES — ALUMINUM

8.1 INTRODUCTION 8.1
8.2 SCOPE 8.1
8.3 MINIMUM MATERIAL MECHANICAL PROPERTIES 8.1
8.4 USE OF THE TABLES 8.1
8.5 DESIGN PROCESS 8.5
8.6 DUCT SELECTION TABLES 8.9
8.7 AUXILIARY TABLES 8.17

CHAPTER 9 HANGERS, SUPPORTS, FASTENERS, GASKETS, AND JOINT SEALANTS

9.1 INTRODUCTION AND SCOPE 9.1
9.2 HANGERS AND SUPPORTS COMMENTARY 9.1
9.3 GENERAL GUIDELINES 9.1
9.4 METHODS FOR HANGING AND SUPPORTING DUCT 9.2
9.5 DUCT HANGERS AND SUPPORTS 9.2
9.6 ISO 4014/4017 BOLTS 9.12
9.7 GASKETS, CAULKING, AND JOINT SEALANTS 9.16

CHAPTER 10 WELDING

10.1 INTRODUCTION 10.1
10.2 WELDED JOINT ACCEPTED INDUSTRY PRACTICE 10.1
10.3 WELDED JOINT CONSIDERATIONS 10.1
10.4 TYPES OF JOINTS AND EDGE PREPARATION 10.8
10.5 WELDING PROCEDURES 10.8

10.6 WELDING SYMBOLS 10.16

CHAPTER 11 ACCEPTED INDUSTRIAL CONSTRUCTION PRACTICES **Page**

11.1 INTRODUCTION 11.1
11.2 COMMON SEAMS AND JOINTS 11.1
11.3 FABRICATION TOLERANCES 11.1

CHAPTER 12 GUIDE SPECIFICATION

12.1 INTRODUCTION 12.1
12.2 DRAWINGS 12.1
12.3 SEISMIC RESTRAINT PROVISIONS 12.1
12.4 GUIDE SPECIFICATION 12.1

APPENDIX A SUPPLEMENTARY DESIGN DATA

A.1 INTRODUCTION A.1

APPENDIX B COMMENTARY ON SURFACE PREPARATION TECHNIQUES

B.1 INTRODUCTION B.1
B.2 METAL SURFACE PREPARATION B.1

APPENDIX C REFERENCED DOCUMENTS

C.1 ISO STANDARDS C.1
C.2 ANSI STANDARDS C.2
C.3 SMACNA STANDARDS C.2
C.4 OTHER STANDARDS C.2
C.5 OTHER RESOURCES C.2

GLOSSARY

INDEX

TABLES **Page**

2–1 Duct Classes and Minimum Conveying Velocities . . . 2.3
2–2 Material Class Descriptions . . . 2.4
2–3 Specific Materials Classes . . . 2.5
3–1 Hot–rolled Steel . . . 3.4
3–2 Cold–rolled Steel . . . 3.5
3–3 Galvanized and Aluminized Steel . . . 3.6
3–4 Yield Strength Reduction Factor (η_f) at Elevated Temperatures for Carbon and Coated Steels . . . 3.7
3–5 Modulus of Elasticity Reduction Factor (η_e) at Elevated Temperatures for Carbon and Coated Steels . . . 3.7
3–6 Stainless Steel . . . 3.9
3–7 Yield Strength Reduction Factor (η_f) at Elevated Temperatures for Stainless Steel . . . 3.10
3–8 Modulus of Elasticity Reduction Factor (η_e) at Elevated Temperatures for Stainless Steel . . . 3.11
3–9 Aluminum Sheet . . . 3.12
3–10 Yield Strength Reduction Factor (η_f) at Elevated Temperatures for Aluminum . . . 3.13
3–11 Modulus of Elasticity Reduction Factor (η_e) at Elevated Temperatures for Aluminum . . . 3.13
3–12 Material Properties and Temperature Limits . . . 3.14
3–13 Corrosion Chart . . . 3.16
4–1 Coefficients for Mode B Analysis . . . 4.10
5–1 Design Example Variables . . . 5.1
6.1–XAX List of Commercial Grade 215 MPa Carbon Steel Tables . . . 6.9
6.2–XAX List of Structural Grade 249 MPa Carbon Steel Tables . . . 6.43
6.3–XAX List of Structural Grade 355 MPa Carbon Steel Tables . . . 6.69
6–X List of Auxiliary Carbon Steel Tables . . . 6.95
7–A.X List of 240 MPa Stainless Steel Tables . . . 7.9
7–X List of Auxiliary Stainless Steel Tables . . . 7.17
8–A.X List of 120 MPa Aluminum Tables . . . 8.9
8–X List of Auxiliary Aluminum Tables . . . 8.17
9–1 Support Capacity of Horizontal Channel . . . 9.6
9–2 Support Capacity of Horizontal Angle . . . 9.7
9–3 Standard Steel Pipe Column – Loads . . . 9.8
9–4 Hanger Rod Capacity . . . 9.9
9–5 Hanger Bar Capacity . . . 9.9
9–6 Hanger Angle Capacity . . . 9.9
9–7 Knee Brace Hanger Capacity . . . 9.10
9–8 Knee Brace Support Capacity . . . 9.11
9–9 ISO 4014/4017 Metric Dimensional Standards for Hex Bolts . . . 9.13
9–10 Bolt Stress Area . . . 9.14
9–11 Gaskets, Caulking, and Joint Sealants . . . 9.16
10–1 Allowable Stress For Stitch Welds . . . 10.3
10–2 Welded Joint Designs — Butt Joints (B) . . . 10.4
10–3 Welded Joint Designs — Corner and Butt Joints (C and B) . . . 10.5
10–4 Welded Joint Designs — Corner and Tee Joints (C and T) . . . 10.6
10–5 Gas Metal Arc Welding of Carbon Steel . . . 10.10
10–6 Shielded Metal Arc Welding (SMAW) of Carbon Steel . . . 10.11
10–7 Gas Tungsten Arc Welding (GTAW) of Carbon Steel . . . 10.11
10–8 Gas Metal Arc Welding (GMAW) of Galvanized Steel . . . 10.12
10–9 Shielded Metal Arc Welding (SMAW) of Galvanized Steel . . . 10.12
10–10 Gas Tungsten Arc Welding (GTAW) of Galvanized Steel . . . 10.12
10–11 Gas Metal Arc Welding of Stainless Steel . . . 10.13
10–12 Shielded Metal Arc Welding (SMAW) of Austenitic Stainless Steel . . . 10.14
10–13 Gas Tungsten Arc Welding (GTAW) of Austenitic Stainless Steel . . . 10.14
10–14 Gas Metal Arc Welding of Aluminum . . . 10.15

10–15 Gas Tungsten Arc Welding (GTAW) of Aluminum 10.15
A–1 Conversion of Wind Loads A.3
A–2 Insulation Physical Data A.7
A–3 Lagging Physical Data A.8
A–4 Thermal Expansion Chart A.9
B–1 Surface Conditions and Recommended Treatment B.2
B–2 Surface Preparation Methods B.2

FIGURES **Page**

4–1 Critical Load Diagrams for Worst Case Conditions 4.4
4–2 Particulate Load 4.5
4–3 Panel Loading—Mode A 4.8
4–4 Panel Loading—Mode B 4.10
4–5 Stiffener Loading 4.11
4–6 Equivalent Beam Cross–Section 4.13
4–7 Flanged Connection 4.13
4–8 Types of Sidewall Buckling 4.17
4–9 Reinforcement Patch 4.18
4–10 Comparison of Critical Buckling Loads for 1200 × 600 mm duct 4.19
4–11 Comparison of Critical Buckling Loads for 1800 × 900 mm duct 4.20
4–12 Internal Supports 4.21
4–13 Fixed Stiffeners 4.22
4–14 Unfixed Stiffeners 4.22
4–15 Definition of Riser Support Loads 4.25
5–1 Subdividing Panels 5.31
5–2 Internal Pipe Supports 5.33
6–1 Critical Load Diagrams for Worst Case Conditions 6.4
6–2 Stiffening Guidelines for Flat Panels 6.6
6–3 Sample Panel capacity Options from Table 6.1–1A.1 . . . . 6.7
6–4 Panel Thickness & Deflection per Stiffener Spacing 6.7
6–5 Stiffener Size per Stiffener Spacing 6.8
7–1 Critical Load Diagrams for Worst Case Conditions 7.4
7–2 Stiffening Guidelines for Flat Panels 7.6
7–3 Sample Panel capacity Options from Table 7–A.3 . . . . 7.7
7–4 Panel Thickness & Deflection per Stiffener Spacing 7.7
7–5 Stiffener Size per Stiffener Spacing 7.8
8–1 Critical Load Diagrams for Worst Case Conditions 8.4
8–2 Stiffening Guidelines for Flat Panels 8.6
8–3 Sample Panel Capacity Options from Table 8–A.2 . . . . 8.7
8–4 Panel Thickness & Deflection per Stiffener Spacing 8.7
8–5 Stiffener Size per Stiffener Spacing 8.8
9–1 Hanger Attachments to Structures 9.3
9–2 Upper Attachment Devices – Typical 9.4
10–1 Joints, Welds, and Grooves 10.7
10–2 Standard Location of Elements of a Welding Symbol 10.18
10–3 Supplementary Symbols 10.18
10–4 Typical Weld Symbols Used forSheet Metal and Light Plate 10.19
10–5 Plate Welding Symbols 10.20
11–1 Longitudinal Seams 11.2
11–2 Longitudinal Seams (continued) 11.3
11–3 Transverse Seams or Joints 11.4
11–4 Crossbraking Light Gage Panels 11.5
11–5 Types of Stiffeners 11.6
11–6 Types of Stiffeners (continued) 11.7
11–7 Internal Pipe Supports 11.8
11–8 Types of Flanged Connections 11.9
11–9 Expansion Joints 11.10
11–10 Flexible Connections 11.11
11–11 Access Doors 11.12
11–12 Explosion Door 11.13
11–13 Various Fittings 11.14
A–1 Basic Wind Speed (kph) A.2
A–2 Snow Ground Load – Western U.S. (lb/sq ft) A.4
A–3 Snow Ground Load – Eastern U.S. (lb/sq ft) A.5
A–4 Glaze Ice Accretion Zone A.6

CHAPTER 1

INTRODUCTION

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 35.0 kPa to positive 35.0 kPa.
- To be supported at intervals not exceeding 10.0 m.
- 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 4.0 m.
- 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: