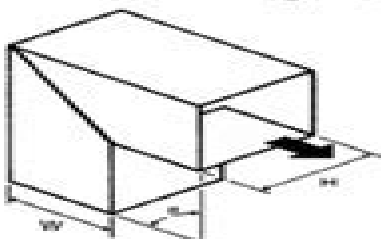
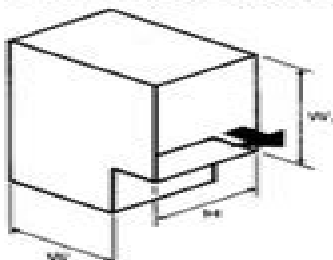


Table 14-10 LOSS COEFFICIENTS, ELBOWS (Cont.)

Use the velocity pressure (V_p) of the upstream section. Fitting loss (TP) = $C \times V_p$
D. Elbow, Rectangular, Mitered (15)


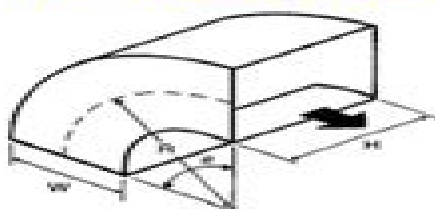
Coefficient C (See Note 2—Page 14.19)

θ	H/W										
	0.25	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
20°	0.08	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.05	0.05	0.05
30°	0.18	0.17	0.17	0.16	0.15	0.15	0.13	0.13	0.12	0.12	0.11
45°	0.38	0.37	0.36	0.34	0.33	0.31	0.28	0.27	0.26	0.25	0.24
60°	0.60	0.59	0.57	0.55	0.52	0.49	0.46	0.43	0.41	0.39	0.38
75°	0.89	0.87	0.84	0.81	0.77	0.73	0.67	0.63	0.61	0.58	0.57
90°	1.3	1.3	1.2	1.2	1.1	1.1	0.98	0.92	0.89	0.85	0.83

E. Elbow, Rectangular, Mitered with Converging or Diverging Flow (15)


Coefficient C (See Note 2—Page 14.19)

H/W	W ₁ /W					
	0.6	0.8	1.2	1.4	1.6	2.0
0.25	1.8	1.4	1.1	1.1	1.1	1.1
1.0	1.7	1.4	1.0	0.95	0.90	0.84
4.0	1.5	1.1	0.81	0.76	0.72	0.66
∞	1.5	1.0	0.69	0.63	0.60	0.55

F. Elbow, Rectangular, Smooth Radius without Vanes (15)


Coefficients for 90° elbows: (See Note 1)

Coefficient C (See Note 3)

R/W	H/W										
	0.25	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
0.5	1.5	1.4	1.3	1.2	1.1	1.0	1.0	1.1	1.1	1.2	1.2
0.75	0.57	0.52	0.48	0.44	0.40	0.39	0.39	0.40	0.42	0.43	0.44
1.0	0.27	0.25	0.23	0.21	0.19	0.18	0.18	0.19	0.20	0.21	0.21
1.5	0.22	0.20	0.19	0.17	0.15	0.14	0.14	0.15	0.16	0.17	0.17
2.0	0.20	0.18	0.16	0.15	0.14	0.13	0.13	0.14	0.14	0.15	0.15

Note 3: Correction Factor for Reynolds number — K_{re}

R/W	$Re, 10^4$								
	1	2	3	4	6	8	10	14	≥ 20
0.5	1.40	1.26	1.19	1.14	1.09	1.05	1.04	1.0	1.0
≥ 0.75	2.0	1.77	1.64	1.56	1.46	1.38	1.30	1.15	1.0

U.S. Units
For Standard Air:
 $R_e = 8.56 DV$

(Metric Units)
($R_e = 60.4 DV$)

where:

D = duct diameter, inches (mm)

V = duct velocity, fpm (m/s)

For Rectangular Ducts:

$$D = \frac{2HW}{H + W}$$

Smacna Duct Design Fitting Loss Coefficients

Harold R. Colen



Smacna Duct Design Fitting Loss Coefficients:

Building Technology Benjamin Stein, 1996 The complete guide to building technology This comprehensive guide provides complete coverage of every aspect of the building technologist's profession It details design and installation procedures describes all relevant equipment and hardware and illustrates the preparation of working drawings and construction details that meet project specifications code requirements and industry standards The author establishes procedures for professional field inspections and equipment operations tests provides real world examples from both residential and nonresidential construction projects and makes specific references to code compliance throughout the text This new edition incorporates changes in building codes advances in materials and design techniques and the emergence of computer aided design CAD while retaining the logical structure and helpful special features of the first edition More than 1 100 drawings tables and photographs complement and illustrate discussions in the text Topics covered include Heating ventilating and air conditioning systems equipment and design Plumbing systems equipment and design Electrical and lighting systems equipment and design Testing adjusting and balancing procedures for all building systems Every aspect of the building technologist's profession from the creation of working drawings through on site supervision and systems maintenance Extensive appendices include conversion factors duct design data test report forms for use in field work design forms and schedules for electrical HVAC and plumbing work and more

Airflow in Ducts Leo A. Meyer, 1996 *HVAC Systems Duct Design* Sheet Metal and Air Conditioning Contractors' National Association (U.S.), 1981

Duct Pressure Drops in HVAC Systems Charles Nehme, The ubiquitous presence of heating ventilation and air conditioning HVAC systems in our modern built environments often leads us to take their essential functions for granted We expect comfortable indoor temperatures clean breathable air and quiet operation without much thought to the intricate engineering that makes it all possible Yet at the heart of every effective HVAC system lies a critical often underestimated principle the management of duct pressure drops For over three decades my work as a global HVAC and MEP Consultant has provided me with a unique vantage point on the evolution of building systems From complex industrial facilities to large scale commercial developments and intricate residential projects across diverse global markets one constant has remained paramount the need for precise and intelligent airflow distribution And nowhere is this more acutely felt than in the challenge of mitigating pressure losses within the ductwork This book *Optimizing HVAC Systems A Comprehensive Guide to Duct Pressure Drop Management* is born from this extensive experience It aims to demystify the science behind air movement in ducts providing a clear and practical guide to understanding calculating and most importantly minimizing the often overlooked phenomenon of pressure drop Why is this topic so vital An HVAC system's fan is essentially a pump tasked with overcoming the resistance of the entire duct network Every bend every transition every filter and every foot of duct length contributes to this resistance demanding more energy from the fan Excessive pressure drop translates directly into Higher Energy Consumption Forcing

the fan to work harder means significantly increased electricity bills and a larger carbon footprint Reduced System Performance Inadequate airflow leads to uneven temperature distribution discomfort and a system that simply cannot meet its design intent Increased Noise High air velocities and turbulent flow often symptoms of poorly managed pressure drop are major culprits in creating noisy HVAC systems Premature Equipment Wear An overworked fan motor will inevitably have a shorter lifespan leading to higher maintenance costs and system downtime Compromised Indoor Air Quality Insufficient ventilation due to restricted airflow can lead to a buildup of pollutants directly impacting occupant health and well being Despite its profound impact the intricacies of pressure drop are sometimes simplified or misunderstood even by seasoned professionals This book seeks to bridge that gap offering a foundational understanding for students and new engineers while providing advanced insights and practical strategies for experienced designers installers and facility managers We will journey from the basic principles of airflow and pressure to the detailed calculations of frictional and dynamic losses We will explore various duct sizing methods the impact of material selection and construction and delve into the critical relationship between fans and the system curve Crucially we will provide actionable strategies for optimizing duct systems for peak energy efficiency offer practical troubleshooting techniques for common issues and touch upon advanced topics and future trends shaping the HVAC industry My hope is that by equipping readers with a comprehensive understanding of duct pressure drop we can collectively contribute to the design and operation of more efficient sustainable and comfortable built environments for generations to come Charles Nehme Global HVAC and MEP Consultant

Duct Design Optimization and Static Pressure Management Charles Nehme, In the world of HVAC system design airflow distribution is both a science and an art At the core of every well functioning HVAC system lies a thoughtfully designed duct network one that not only ensures thermal comfort but also maintains energy efficiency acoustic performance and system longevity Yet among all components ductwork is often undervalued or improperly implemented leading to excessive energy consumption occupant discomfort and system inefficiencies This book Duct Design Optimization and Static Pressure Management was written to address that gap It provides a comprehensive technical and practical approach to understanding the dynamics of duct design and the importance of managing static pressure across HVAC systems Whether you re designing new systems or troubleshooting existing ones mastering these concepts is essential for sustainable performance Drawing on more than 30 years of global HVAC experience I have structured this book to serve both seasoned professionals and newcomers It begins with the fundamental principles of airflow and pressure then progresses through design methodologies fan system integration field diagnostics and real world optimization techniques Each chapter builds upon the last aiming to give the reader a complete toolkit for effective duct system design and operation This work is based on internationally recognized standards practical case studies and proven techniques used across commercial industrial and residential applications You will find useful checklists design tips diagnostic methods and energy saving strategies that can be implemented right away

As we move toward more sustainable and performance driven building systems efficient duct design and static pressure management are no longer optional they are essential I hope this book helps HVAC professionals elevate their design standards solve persistent performance issues and contribute to more energy conscious buildings around the world Charles Nehme WWW CFN HVAC COM Environmental Systems Technology W. David Bevirt,1984 **HVAC Duct Pressures and Static Regain** Charles Nehme, The efficient and effective distribution of air is the lifeblood of any modern building directly impacting occupant comfort indoor air quality and critically energy consumption Yet the principles governing airflow within HVAC ductwork specifically pressures and the concept of static regain are often misunderstood or underutilized even by seasoned professionals This oversight can lead to oversized fans excessive energy bills persistent noise issues and ultimately systems that fail to deliver their intended performance Having dedicated over three decades to navigating the complexities of HVAC and MEP systems across diverse global markets from intricate industrial facilities to expansive commercial developments and detailed residential projects I ve witnessed firsthand the profound impact that meticulous duct design can have My career has been a continuous journey of understanding how theoretical principles translate into practical high performing and sustainable built environments This book is a distillation of that experience aimed at bridging the gap between fundamental aerodynamic principles and their real world application in HVAC design My primary motivation in writing this guide stems from a recognition of a persistent challenge in our industry the tendency to simplify duct design at the expense of true optimization While various duct sizing methods exist the often overlooked power of static regain when properly understood and applied offers unparalleled opportunities for achieving balanced airflow reducing fan energy and ensuring quieter operations This is not just about avoiding problems it s about elevating HVAC systems to a higher standard of efficiency and reliability This book is intended for HVAC engineers designers consultants and technicians anyone involved in the design installation commissioning or troubleshooting of air distribution systems Whether you are a student just embarking on your engineering journey a professional seeking to deepen your understanding or an experienced practitioner looking for advanced optimization strategies this resource aims to provide clarity practical methodologies and actionable insights We will begin by establishing a solid foundation in the basic fluid dynamics of airflow and the critical definitions of static velocity and total pressures From there we will explore various pressure loss mechanisms and delve into the comparative analysis of different duct sizing methods with a particular emphasis on the theory and practical application of the static regain method Subsequent sections will guide you through advanced design considerations the crucial interaction between fans and duct systems strategies for maximizing energy efficiency and an overview of the latest tools standards and best practices It is my sincere hope that this book empowers you to approach HVAC duct design with greater confidence precision and a renewed appreciation for the elegant interplay of pressures that dictates the performance of our buildings vital organs By mastering these principles you will not only enhance your projects but also contribute to a more sustainable

and comfortable built world Charles Nehme Global HVAC and MEP Consultant Handbook of Heating, Ventilation, and Air Conditioning Jan F. Kreider, 2000-12-26 The building industry accounts for about 25 percent of the US gross national product through the design construction operation and maintenance of commercial institutional and residential buildings The Handbook of Heating Ventilation and Air Conditioning provides a current comprehensive review of the latest procedures and trends in the industry It combines practice and theory systems and control and modern methods and technologies to provide in one volume all of the design and operation information needed by HVAC engineers Through a link on the CRC Web site owners of the handbook can access new material periodically posted by the author **National Mechanical Estimator** Ottaviano Technical Services, Victor B Ottaviano, 2001 **National Mechanical Estimator** Victor B. Ottaviano, 1993

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