The Structural Design of Air and Gas Ducts for Power Stations and Industrial Boiler Applications

Air and Gas Duct Structural Design Committee of the Energy Division of the American Society of Civil Engineers

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ABSTRACT

This document, The Structural Design of Air & Gas Ducts for Power Stations & Industrial Boiler Applications, has been created to assist structural engineers when performing the structural analysis and design of ductwork. Air and gas ducts for fossil fuel power stations and industrial boiler applications are unique structures. Considering that ductwork structural analysis and design is not currently referenced or governed by any national code or design standard, this publication presents the structural engineer with current approaches for the structural analysis and design of air and flue-gas ductwork. Included are sections on: 1) Material selection, behavior and performance; 2) design loads, loading combinations and allowable stresses; 3) thermal considerations; 4) vibration considerations; 5) structural arrangement and behavior; 6) toggle duct behavior and expansion joint considerations; 7) overall duct structural analysis and design methods; and 8) design considerations for local elements of the structure, such as stiffeners, internal braces, connections, turning vanes, and other flow distribution devices. This document also discusses drawing and specification content, fabrication and construction techniques and considerations, duct support methods, and special considerations regarding the design of duct support structures. Finally, it talks about field maintenance examinations ad inspections for the purpose of preventative maintenance or condition assessment.

Library of Congress Cataloging-in-Publication Data

The structural design of air and gas ducts for power stations and
industrial boiler applications / Air and Gas Duct Structural Design Committee of the
Energy Division of the Air and Gas Duct Structural Design Committee.
p. cm.
Includes bibliographical references and index.
ISBN 0-7844-0112-8
1. Power plants—Equipment and supplies. 2. Steam-boilers.3. Air ducts—Design and construction. 4. Flue gases. I. American Society of Civil Engineers. Air and Gas Duct Structural Design Committee.
TJ164.S87 1995 95-24709
621.31'2—dc20 CIP

Library of Congress Catalog Card No: 95-24709
ISBN 0-7844-0112-8
Manufactured in the United States of America.

PREFACE

This ASCE Special Publication has been created by a select committee of structural and mechanical engineers who are extremely experienced in the structural analysis and design of air and flue-gas ductwork for power stations and large industrial boiler applications.

The need for this document was identified in 1991 by the ASCE Fossil Power Committee under the chairmanship of Thomas Longlais. Tom obtained the authorization of the ASCE through the Energy Division to create the Task Committee assigned to produce this Special Publication. Subsequently, the ASCE Task Committee on the Structural Design of Air & Gas Ducts was created late in 1991 under my chairmanship. My first, and most important task, was to form a working committee of qualified individuals from various sectors of the power and boiler industries. I believed that the best committee would consist of representatives from all facets of the ductwork industry: owners, consulting engineers, equipment suppliers and duct suppliers. I tried to recruit individuals from these types of representative major companies that perform the structural analysis and design of ducts. The committee started out in January of 1992 with about 25 members, but gradually shrunk to a working group of 19. All of these individuals put a considerable amount of work into this effort and I thank them all.

Air & Gas Duct
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The most significant and time consuming contributions were made by the individuals who actually authored the various sections of this ASCE Special Publication. These individuals are noted on the previous page with an asterisk after their name. They all deserve a special thanks for their commitment and hard work.

In addition, many of the task committee members obtained important help from other engineers and designers within their organizations. I give my thanks to all of them. Some of the more significant contributors to the success of this ASCE Special Publication were: Daniel Biss, David Wagner, Timothy Frymoyer, and Kenneth Bauer from Gilbert/Commonwealth and Edward Hanko from Sargent & Lundy.

Ronald L. Schneider
ASCE Member
June 1995

American Society of Civil Engineers
Special Publication

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