This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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An American National Standard

Standard Guide for Design, Fabrication, and Erection of Fiberglass Reinforced (FRP) Plastic Chimney Liners with Coal-Fired Units[1]

This standard is issued under the fixed designation D5364; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Federal and state environmental regulations have imposed strict requirements to clean the gases leaving a chimney. These regulations have resulted in taller chimneys (600–1000 ft (183–305 m)) and lower gas temperatures (120–200°F (49–93°C)) due to the use of Air Quality Compliance Systems (ACQS). These regulations led to the development of fiber reinforced plastics (FRP) chimney liners in the 1970's.

Fiberglass-reinforced plastic liners have proven their capability to resist corrosion and carry loads over long periods of time. Successful service has been demonstrated in the utility and general-process industries for over 40 years. The taller FRP structures and larger diameters (10–30 ft (3–9 m)) imposed new design, fabrication, and erection challenges.

The design, fabrication, and erection of FRP liners involves disciplines which must address the specific characteristics of the material. Areas that have been shown to be of importance include the following:

(1) Flue-gas characteristics such as chemical composition, water and acid dew points, operating and excursion temperature, velocity, etc.

(2) Plant operation as it relates to variations in the flue-gas characteristics.

(3) Material selection and laminate design.

(4) Quality control throughout the design, fabrication, and erection process to ensure the integrity of the corrosion barrier and the structural laminate.

(5) Secondary bonding of attachments, appurtenances, and joints.

(6) Installation and handling.

(7) Inspections and Confirmation Testing.

Chimney components include an outer shell, one or more inner liners, breeching ductwork, and miscellaneous platforms, elevators, ladders, and miscellaneous components. The shell provides structural integrity to environmental forces such as wind, earthquake, ambient temperatures, and supports the liner or liners. The liner or liners inside the shell protects the shell from the thermal, chemical, and abrasive environment of the hot boiler gases (generally 120–560°F (49–293°C)). These liners have been made of FRP, acid-resistant brick, carbon steel, stainless steel, high-alloy steel, shotcrete-coated steel, and shotcrete-coated shells. The selection of the material type depends on the chemical composition and temperature of the flue gas, liner height, diameter, and seismic zone. Also, variations in flue-gas characteristics and durations of transient temperatures affect material selection and design. For FRP liners, the flue gas maximum operating temperature is generally limited to 200°F (90°C) for 2 hours and for maximum transient temperatures to 400°F (204°C) for 30 minutes.

1. Scope

1.1 This guide offers direction and guidance to the user concerning available techniques and methods for design, material selection, fabrication, erection, inspection, confirmatory testing, quality control and assurance.

1.2 These minimum guidelines, when properly used and implemented, can help ensure a safe and reliable structure for the industry.

1.3 This guide offers minimum requirements for the proper design of a FRP liner once the service conditions relative to thermal, chemical, and erosive environments are defined. Due

[1] This guide is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.23 on Reinforced Plastic Piping Systems and Chemical Equipment.

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