

Formula 1

Content placeholder

Formula 2

Content placeholder

Detailed Explanation

NFPA 85: Boiler and Combustion Systems Hazards Code (2023 edition) addresses fire, explosion, and toxicity hazards associated with boilers, fired heaters, and related thermal systems—including those integrated with molten salt-based thermal energy storage (TES). Table 12.3.2 is a critical materials specification table that correlates common structural alloy classes (e.g., carbon steel, low-alloy steels, austenitic stainless steels, nickel-based superalloys) with their respective upper temperature limits for continuous service in contact with molten nitrate/nitrite-based salts (e.g., Solar Salt: 60% NaNO₂–40% KNO₃) or chloride-based salts (e.g., MgCl₂–KCl–NaCl mixtures). These limits are derived from empirical corrosion testing, long-term exposure data, and industry consensus on acceptable rates of material loss (<10 mils/year) and mechanical property retention. The table explicitly differentiates between 'oxidizing' (nitrate-based) and 'reducing/chloride' environments due to their vastly different corrosion mechanisms—chlorides induce pitting and stress corrosion cracking at lower temperatures, thus imposing stricter limits than nitrates for many alloys. Compliance with Table 12.3.2 is mandatory for NFPA 85–compliant design of TES containment vessels, piping, heat exchangers, and salt pumps, particularly in industrial cogeneration, concentrated solar power (CSP), and waste-heat recovery applications where molten salts serve as both heat transfer fluid and storage medium.

Key Components

#	Component
1	Alloy Class Designation (e.g., P1, P5, P9, TP316, Alloy 625)

#	Component
2	Molten Salt Type (Oxidizing vs. Chloride-Based)
3	Maximum Allowable Metal Temperature (MAMT)

Applications

#	Application
1	Design of molten salt thermal energy storage tanks and piping systems
2	Material selection for high-temperature heat exchangers in CSP plants
3	Safety certification and code compliance review for industrial boiler retrofits with TES integration

Related Concepts

#	Concept
1	ASME BPVC Section II Part D (Materials)
2	ASTM G110 (Corrosion Testing of Molten Salts)
3	Thermal Energy Storage System Sizing

Tags

NFPA 85, molten salt, alloy compatibility, thermal energy storage, high-temperature corrosion

NFPA 85-2023 Table 12.3.2: Maximum Allowable Molten Salt Temperatures by Alloy Class