

Formula 1

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Formula 2

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Formula 3

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Formula 4

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Detailed Explanation

The poster distills Chapter 2 of ASCE/SEI 7-22—'Minimum Design Loads and Associated Criteria'—specifically focusing on Section 2.3 (Strength Design Load Combinations) and their application to foundation elements. Unlike building frame analysis, foundation design requires careful consideration of how load effects (e.g., axial force, moment, shear) are distributed into soil, making correct load combination selection essential for both ultimate limit state (ULS) verification and serviceability checks. The poster typically organizes combinations by governing load case (e.g., 'wind-controlled', 'seismic-controlled', ' $1.2D + 1.6L + 0.5(L_r \text{ or } S \text{ or } R)$ ') and highlights special provisions such as the 0.9D reduction for overturning stability and the inclusion of load reduction factors for simultaneous environmental loads per Section 2.3.3. It also clarifies distinctions between combinations used for footing strength (concrete/steel design) versus those used for soil bearing capacity and sliding resistance—where ASD (Allowable Stress Design) alternatives may still apply, though LRFD is primary per ASCE 7-22. Practitioners rely on this resource to avoid misapplication of combinations—especially when multiple transient loads (e.g., wind + seismic) are mutually exclusive—and to ensure compliance during plan

review and peer checking.

Key Components

#	Component
1	Factored Load Combination Equations (LRFD)
2	Load Type Abbreviations & Definitions (D, L, Lr, S, R, W, E, H, F)
3	Design Context Notes (e.g., 'Use for Strength Design Only', 'Apply 0.9D for Overturning Checks')

Applications

#	Application
1	Preliminary sizing and reinforcement design of spread footings and wall footings
2	Verification of soil bearing pressure against allowable or ultimate capacity
3	Sliding and overturning stability checks for retaining walls and cantilevered foundations

Related Concepts

#	Concept
1	Load and Resistance Factor Design (LRFD)
2	Shallow Foundation Bearing Capacity
3	Overturning and Sliding Stability

Tags

ToolFusion Engineering