

Progetto DPC-ReLuis 2024-2026

WP 18 Input Sismico, Normativa e Microzonazione

Task 2

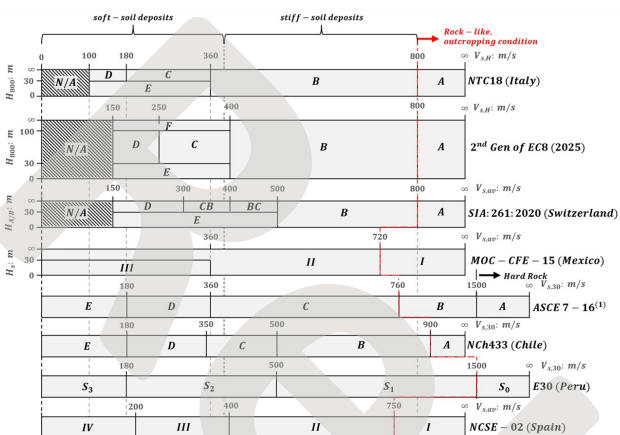
Confronto dei metodi semplificati per la stima dell'effetto di sito nelle normative internazionali

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Coefficient-Based Approaches

These methods **modify a reference rock spectrum** using **site factors defined for soil classes**. These factors adjust shape and amplitude to reflect frequency dependence and, in some codes, nonlinear soil behavior. **Simple, standardized, and widely used** (e.g., NTC18, ASCE/SEI 7-16).

Site Classes definition

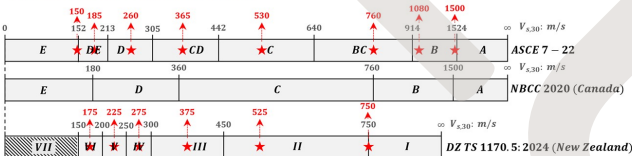


1. Other standards with site classes adopted from ASCE 7-16: NSR-10 (Colombia), GBDS-2020 (Bolivia), NEC-SE-DS-16 (Ecuador), TB07-18 (Turkey), SNI 1726 (Indonesia).

Probabilistic Class-Based Approaches

Instead of site factors, these methods provide **mapped site-specific response spectra** directly, **integrating hazard and site effects in one step**. Based on **NSHMs** (e.g., ASCE/SEI 7-22), they capture intensity dependence and **regional seismicity more consistently**.

Site Classes definition

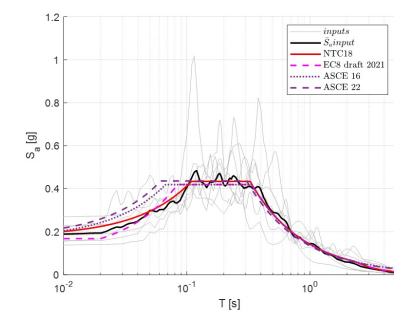


★ characteristic values from which the response spectra are derived from.

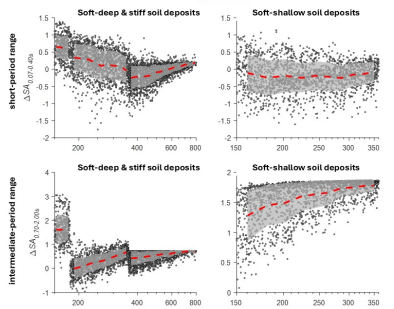
Comparison with stochastic EQLs Database

Medium-Seismicity Site (Urbino, Italy) : $a_g = 1.74 \text{ m/s}^2$

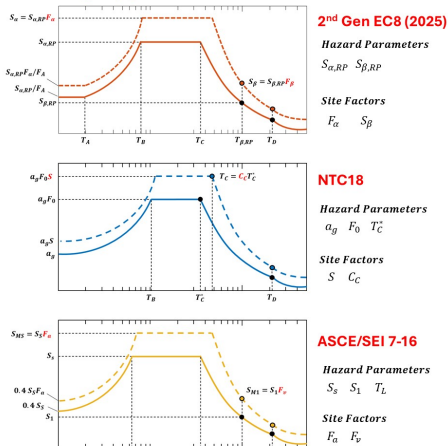
Reference Bedrock: $V_s = 800 \text{ m/s}$



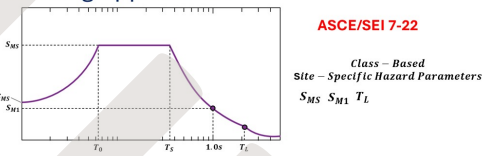
NTC18



Existing Approaches

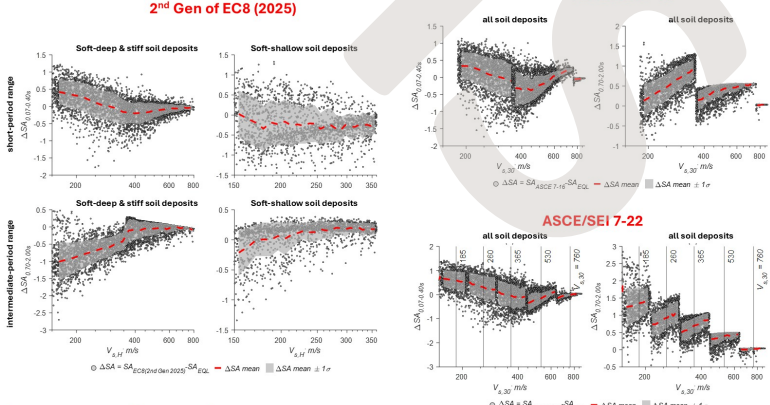


Existing Approaches



$$\Delta SA_{T_0-T_1} = \left(\frac{\int_{T_0}^{T_1} S_{e,s}}{\int_{T_0}^{T_1} S_{e,1}} \right)_{\text{standard}} - \left(\frac{\int_{T_0}^{T_1} S_{e,s}}{\int_{T_0}^{T_1} S_{e,1}} \right)_{\text{EQL}}$$

ASCE/SEI 7-16



Important Remarks

Design philosophy is important to consider – some examples:

ASCE – MCE model – $T_r = 2475 \text{ years}$ – seismic design classes

Turkey – response spectra for different T_r depending on the considered limit state

NTC18 – $T_r = 475 \text{ years}$ (as most of the countries) – risk classes

Intensity- or not intensity-dependent site-coefficients (e.g., Japan and Chile, Switzerland cases).

Conclusions

No significant differences between ASCE 7-16 and ASCE 7-22. However, ASCE 7-22 tends to shift a little more towards the safe side, in both range of periods considered maybe because of the more discretized site classes.

At short-period ranges, all codes are generally on the unsafe side. This trend changes just for soft-deep soil deposits.