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Civil Engineering: Structural Engineering

Topic: Development Length for Hooked Bars in Lightweight Concrete

Problem Statement:

What value of modification factor is used for the development of hooked bars in tension for lightweight concrete according to the ACI code?

Given:

- 1.25
- 0.75
- 0.5
- 1.0

Solution:

Step 1: Introduction and Given
In structural engineering, the development length of reinforced bars in concrete is crucial for ensuring adequate bonding between the steel and the concrete. When lightweight concrete is used, certain factors and modification coefficients are applied to account for the different material properties from normal-weight concrete. According to the ACI (American Concrete Institute) code, the commonly used modification factor for lightweight concrete needs to be considered.

Supporting Statement: The development length calculations ensure safe bonding between steel bars and concrete, especially important in lightweight concrete which has different properties.

Step 2: Modification Factor for Lightweight Concrete
In the context of development length for hooked bars in tension for lightweight concrete, the ACI code prescribes a specific modification factor (\(\lambda \)).

- According to ACI 318 (Building Code Requirements for Structural Concrete), the modification factor (\(\lambda \)) for lightweight concrete is 1.3. However, in certain sections specifically addressing development length of bars in tension, hooked bars might observe a different factor due to additional empirical adjustments.

Supporting Statement: ACI code provisions ensure adjustments are accurately made based on the type of concrete to ensure proper structural integrity.

Step 3: Identifying the Correct Modification Factor
From the choices provided, the factor that closely aligns with ACI standards for hooked bars in tension for lightweight concrete is:

****1.3****

Supporting Statement: This modification factor influences the calculations of development length to adjust for different bond characteristics presented by lightweight concrete.

Step 4: Conclusion
Therefore, the correct value of the modification factor used for the development of hooked bars in tension for lightweight concrete according to the ACI code is:

1.3

Supporting Statement: The final solution concurs with the ACI code standards for calculating the development length of hooked bars in lightweight concrete to ensure safe and reliable structural performance.

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