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Concrete Anchorage Design v1.5.0 User Manual   Dongxiao Wu P. Eng.
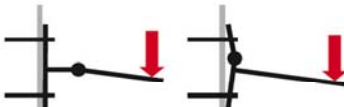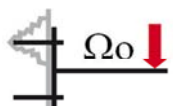
4.0   SEISMIC DESIGN REQUIREMENTS

4.1 ACI 318-11 and ACI 318M-11 Code

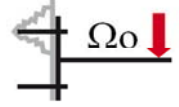Seismic Design Requirements For Tension → D.3.3.4.3

This input is required   when seismic SDC >= C (D.3.3.1) and Tensile E > 0.2U (D.3.3.4.2)
User can ignore this input when seismic SDC < C (D.3.3.1)   or   Tensile E <= 0.2U (D.3.3.4.1)

Options to Satisfy Additional Seismic Requirements	Required Strength
Option 1 D.3.3.4.3(a) Ductile anchor connection 	U = 1.2D + 1.0E + 1.0L + 0.2S Eq. (9-5) U = 0.9D + 1.0E Eq. (9-7) * When Option 1 is selected, user has to verify the conditions in D.3.3.4.3(a) subsections 3~6, as applicable, are met. * The program will flag OK if D.3.3.4.3(a) subsections 1 & 2 are met and the ductile anchor steel strength has the highest utilization ratio.
Option 2 D.3.3.4.3(b) Ductile attachment 	* The anchor bolt's steel attachments, such as steel base plate or column, will go for ductile yielding before or at the time when the anchor bolt reaching the tensile load N_u user input above. * User may re-input the tensile load N_u above to satisfy this option.
Option 3 D.3.3.4.3(c) Nonyielding attachment 	* The anchor bolt's non-yielding attachments, such as wood sill plate, will go for non-ductile failure, such as crushing, before or at the time when the anchor bolt reaching the tensile load N_u user input above. * User may re-input the tensile load N_u above to satisfy this option.
Option 4 D.3.3.4.3(d) Overstrength forces 	* The tensile load N_u user input above includes the seismic load E, with E increased by multiplying overstrength factor Ω_o * User may re-input the tensile load N_u above to satisfy this option. U = 1.2D + Ω_o (1.0E)+ 1.0L + 0.2S Eq. (9-5) U = 0.9D + Ω_o(1.0E) Eq. (9-7)

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Seismic Design Requirements For Shear → D.3.3.5.3

This input is required   when seismic SDC >= C (D.3.3.1) and Shear E > 0.2U (D.3.3.5.2)
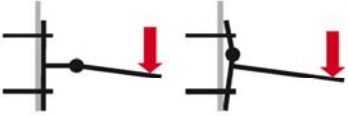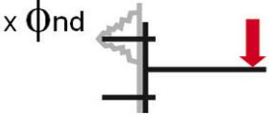User can ignore this input   when seismic SDC < C (D.3.3.1)   or Shear E <= 0.2U (D.3.3.5.1)

Options to Satisfy Additional Seismic Requirements	Required Strength
Option 1 D.3.3.5.3(a) Ductile attachment 	* The anchor bolt's steel attachments, such as steel base plate or column, will go for ductile yielding before or at the time when the anchor bolt reaching the shear load V_u user input above. * User may re-input the shear load V_u above to satisfy this option.
Option 2 D.3.3.5.3(b) Nonyielding attachment 	* The anchor bolt's non-yielding attachments, such as wood sill plate, will go for non-ductile failure, such as crushing, before or at the time when the anchor bolt reaching the shear load V_u user input above. * User may re-input the shear load V_u above to satisfy this option.
Option 3 D.3.3.5.3(c) Overstrength forces 	* The shear load V_u user input above includes the seismic load E, with E increased by multiplying overstrength factor Ω_o * User may re-input the shear load V_u above to satisfy this option. U = 1.2D + Ω_o (1.0E)+ 1.0L + 0.2S Eq. (9-5) U = 0.9D + Ω_o(1.0E) Eq. (9-7)

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4.2 ACI 318-08 and ACI 318M-08 Code

Seismic Design Requirements For Tension → D.3.3.4 ~ D.3.3.6

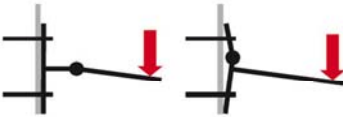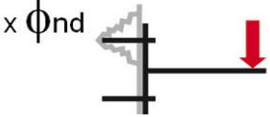This input is required when seismic SDC >= C (D.3.3)

User can ignore this input when seismic SDC < C (D.3.3)

Options to Satisfy Additional Seismic Requirements	Required Strength
Option 1 D.3.3.4 Ductile anchor connection 	Option 1 is satisfied if $\phi\,N_{sa} < 0.75\,\phi\,(\,N_{cbg}\,,\,N_{pn}\,,\,N_{sbg}\,)$ The design steel strength must be the governing design strength and having the highest utilization ratio. The program will flag NG if Option 1 is selected and this condition is not met.
Option 2 D.3.3.5 Ductile attachment 	The anchor bolt's steel attachments, such as steel base plate or column, will go for ductile yielding before or at the time when the anchor bolt reaching the tensile load N_u user input above. User may re-input the tensile load N_u above to satisfy this option.
Option 3 D.3.3.6 Non-ductile reduction factor ϕ_{nd} 	Non-ductile reduction factor ϕ_{nd} will be applied to the concrete failure modes. Option 3 is satisfied if $\phi_{nd}\,\phi\,N_n > N_u$ User shall input non-ductile reduction factor ϕ_{nd} next line if Option 3 is selected.

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Seismic Design Requirements For Shear → D.3.3.4 ~ D.3.3.6

This input is required when seismic SDC >= C (D.3.3)

User can ignore this input when seismic SDC < C (D.3.3)

Options to Satisfy Additional Seismic Requirements	Required Strength
Option 1 D.3.3.4 Ductile anchor connection 	Option 1 is satisfied if $\phi\, V_{sa} < 0.75\, \phi\, (\, V_{cbg}\, ,\, V_{cpg}\,)$ The design steel strength must be the governing design strength and having the highest utilization ratio. The program will flag NG if Option 1 is selected and this condition is not met.
Option 2 D.3.3.5 Ductile attachment 	The anchor bolt's steel attachments, such as steel base plate or column, will go for ductile yielding before or at the time when the anchor bolt reaching the tensile load V_u user input above. User may re-input the tensile load V_u above to satisfy this option.
Option 3 D.3.3.6 Non-ductile reduction factor ϕ_{nd} 	Non-ductile reduction factor ϕ_{nd} will be applied to the concrete failure modes. Option 3 is satisfied if $\phi_{nd}\, \phi\, V_n > V_u$ User shall input non-ductile reduction factor ϕ_{nd} next line if Option 3 is selected.