The effects of seismic relative displacements shall be considered in combination with displacements caused by other loads as appropriate.

13.4 NONSTRUCTURAL COMPONENT ANCHORAGE

Nonstructural components and their supports shall be attached (or anchored) to the structure in accordance with the requirements of this section and the attachment shall satisfy the requirements for the parent material as set forth elsewhere in this standard.

Component attachments shall be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity. A continuous load path of sufficient strength and stiffness between the component and the supporting structure shall be provided. Local elements of the structure including connections shall be designed and constructed for the component forces where they control the design of the elements or their connections. The component forces shall be those determined in Section 13.3.1, except that modifications to F_p and R_p due to anchorage conditions need not be considered. The design documents shall include sufficient information relating to the attachments to verify compliance with the requirements of this section.

13.4.1 Design Force in the Attachment

The force in the attachment shall be determined based on the prescribed forces and displacements for the component as determined in Sections 13.3.1 and 13.3.2, except that R_p shall not be taken as larger than 6.

13.4.2 Anchors in Concrete or Masonry.

13.4.2.1 Anchors in Concrete

Anchors in concrete shall be designed in accordance with Appendix D of ACI 318.

13.4.2.2 Anchors in Masonry

Anchors in masonry shall be designed in accordance with TMS 402/ACI 503/ASCE 5. Anchors shall be designed to be governed by the tensile or shear strength of a ductile steel element.

EXCEPTION: Anchors shall be permitted to be designed so that the attachment that the anchor is connecting to the structure undergoes ductile yielding at a load level corresponding to anchor forces not greater than their design strength, or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the component.

13.4.2.3 Post-Installed Anchors in Concrete and Masonry

Post-installed anchors in concrete shall be prequalified for seismic applications in accordance with ACI 355.2 or other approved qualification procedures. Post-installed anchors in masonry shall be prequalified for seismic applications in accordance with approved qualification procedures.

13.4.3 Installation Conditions

Determination of forces in attachments shall take into account the expected conditions of installation including eccentricities and prying effects.

13.4.4 Multiple Attachments

Determination of force distribution of multiple attachments at one location shall take into account the stiffness and ductility of the component, component supports, attachments, and structure and the ability to redistribute loads to other attachments in the group. Designs of anchorage in concrete in accordance with Appendix D of ACI 318 shall be considered to satisfy this requirement.

13.4.5 Power Actuated Fasteners

Power actuated fasteners in concrete or steel shall not be used for sustained tension loads or for brace applications in Seismic Design Categories D, E, or F unless approved for seismic loading. Power actuated fasteners in masonry are not permitted unless approved for seismic loading.

EXCEPTION: Power actuated fasteners in concrete used for support of acoustical tile or lay-in panel suspended ceiling applications and distributed systems where the service load on any individual fastener does not exceed 90 lb (400 N). Power actuated fasteners in steel where the service load on any individual fastener does not exceed 250 lb (1,112 N).

13.4.6 Friction Clips

Friction clips in Seismic Design Categories D, E, or F shall not be used for supporting sustained loads in addition to resisting seismic forces. C-type beam and large flange clamps are permitted for hangers provided they are equipped with restraining straps equivalent to those specified in NFPA 13, Section 9.3.7. Lock nuts or equivalent shall be provided to prevent loosening of threaded connections.