CENTRAL OFFICE
EQUIPMENT FRAMEWORK DESIGN REQUIREMENTS

1. GENERAL

A. Scope

1.01 These guidelines provide physical performance requirements for equipment framework designs intended for use in Nevada Bell/Pacific Bell/Southwestern Bell network equipment environments. The guidelines are issued to assure consistent load carrying capabilities of equipment frameworks.

B. Application

1.02 Company guidelines require telecommunications equipment suppliers test their products to NEBS (Bell Communications Research, BELLCORE, Technical Reference, GR-63-CORE, Network Equipment-Building Systems Generic Equipment Requirements) seismic requirements. Many vendors purchase equipment frames to mount their equipment. The physical performance of their equipment relies upon the integrity of the equipment frames. Physical performance of the equipment frames vary greatly from style of frame, source of frame and weight of equipment in frames.

1.03 The framework guidelines in this document establish basic performance parameters of frames. Only frames that have demonstrated compliance to these guidelines shall be used in company equipment facilities. These guidelines shall be used with other existing references for the dimensional, functional and appearance requirements.

2. DESCRIPTION OF FRAME

A. General

2.01 Frames used for mounting telecommunications equipment typically are designed with two upright steel channels joined by a base assembly and top channel crossmember. The base has provisions for securing the frame to the building floor surfaces. The top channel may be secured to overhead auxiliary framing or cableway system in some equipment environments.

B. Frame Styles

2.02 There are many styles of frames available for mounting telecommunications equipment. Unequal flange frames are commonly used with transmission and common equipment. Channel frames are commonly used with power equipment, microwave radio and switching equipment. A variety of specialized frames for equipment unique dimensions are used. The application of these specialized frames are limited.

2.03 Formed steel base assemblies are commonly incorporated into unequal flange frames and channel frames of switching equipment. Steel angles are used as the base with channel frames for radio, power and common equipment. All base styles are acceptable if the frame meet performance guidelines and equipment application.

C. Construction

2.04 Frames are designed and manufactured with welded joints or bolted joints. The uprights are joined at the top crossmember and at various locations at the base. Bolted joints rely on torque of fasteners for strength. Improperly torques fasteners, loosening of fasteners due to vibration or wrong size fasteners will allow frames to sway above design parameters. For **High Seismic Risk** locations (Zones 3,4) bolted frames will not be acceptable. Only frames of welded construction shall be used for those installations. It is recommended that bolted frames not be used in **Low Seismic Risk** (Zones 0,1,2) due to the inconsistent performance of a fastened joint.

3. PERFORMANCE CRITERIA

A. General

3.01 The frame shall be capable of accepting lateral and vertical loads without stress failure of the frame. Under load, the frame may deflect but must return to its original start point when load is removed. Slight offset of frame, within ±0.25 inch, from start point will be acceptable if frame parts have not experienced stress failures. Stress failures are bent uprights, buckled flanges, torsional twist, base distortion, broken welds or other signs of plastic deformation to any element of the framework.

B. Parameters

3.02 The frame must accept the static loads and recover without stress failure.

(a) Horizontal front and back axis

Apply a horizontal lateral load increasing to 700 pounds. Frame deflection shall not exceed 2.0 inches at top of frame. Frame must return to original start point within ± 0.25 inch when load is removed.

(b) Side axis

Apply a horizontal lateral load increasing to 600 pounds. Frame deflection shall not exceed 2.0 inches at top of frame. Frame must return to original start point within ±0.25 inch when load is removed.

(c) Vertical axis

With 1000 pounds downward load at top of crossmember, bowing at mid height of uprights shall not exceed 0.125 inch.

C. Qualification

3.03 The qualified equipment frame will be allowed a maximum of 450 pounds of equipment to be installed. Mounted loads above 450 pounds will require stronger frame design and will require qualification to requirements for comparable frame deflection and bending stress.

4.0 MOUNTING AND SUPPORT

A. General

4.01 The frames shall be mounted to the test floor in a free standing configuration. Through bolts, welded studs or other positive anchorages may be used to assure no anchor creep or pullout. No more than four (4) and no larger than 12mm (1/2”) diameter anchor bolts shall be used to anchor frames for test. All base hardware used with anchors are to be included, i.e. shims, washers, plates and bushings.

5. TEST SPECIMEN

A. General

5.01 One (1) sample of each style of 7'-0" frame will be subjected to tests. Frames with similar uprights except with alternative base design must each be tested. The tested frame must be equal to a normal production frame. Any revisions, changes or substitutions made to tested frame design subsequent to qualification tests will require new qualification tests unless otherwise documented by Pacific Bell.

5.02 The frame shall be tested without any equipment shelves, blank plates, shipping plates or other attachments. A frame is considered to be an assembly of one (1) pair of uprights. Multiple frames with more than one (1) pair of uprights must conform to Performance Criteria values multiplied by the number of pairs of uprights, i.e. double frame with two pairs of uprights, side axis load = 600 pounds X 2 to 2.0 inches, within ± 0.25 inch.

6. TEST REQUIREMENTS

A. Scope

6.01 Each tested frame will be tested in four (4) individual axes, front, back, one side and vertical. Load will be applied at the frame top crossmember for each test axes. Test load applied must be at right angles over the crossmember. Frames are to loaded by either of two ways.

(a) Hydraulic Cylinder: A hydraulic cylinder with minimum of 5 inch stroke and pump shall be used to load frame as shown in Figure 1A. Attach one end of the cylinder to a stationary structure. The other end of the cylinder is attached to the frame. A load cell or tension scale is placed inline at the frame end of the cylinder for measuring load.

(b) Hanging Weights: Individual cast iron weights with a cable pulley system shall be used to load the frame as shown in Figure 1B. Attach a weight holder to one end of the cable. The other end of the cable is attached to the frame. The cable is passed through a low friction pulley mounted to a stationary structure. The pulley suspends the weights vertically and apply tension to the cable. A load cell or tension scale is placed inline at the frame end of the cable.

7. DATA REQUIREMENTS

A. General

7.01 The displacement at the top of the frame will be measured and recorded. Displacement transducers can be used to measure the rack movement and plotted. Measurement made with a calibrated rule or gauge within ± .0625 inch from a stationary point are acceptable if transducer is not available. The frame shall be measured by the transducer or a rule at the top corner of frame, Figure 2. The frame displacement is the distance the frame corner has moved from the reference start point when load is applied.

7.02 Test loads will be measured and recorded. The range of measuring instrument required will be 0 to 1200 pounds. A load cell strain gauge may be used to record the loads. A simple tension scale with accuracy of ± 2.5 pounds may be used if load cell is not available.

7.03 For vertical loads, the deflection between uprights shall be measured and recorded. The readings shall be taken at mid-height of uprights, Figure 3, with displacement transducer or calipers.

8. TEST PROCEDURE

A. Scope

8.01 All tests shall be conducted on equipment frames in accordance to procedures described.

(a) Lateral Loads

(1) Mount the frame to test floor as described in Mounting and Support paragraph. Attach the load cable or cylinder to the top crossmember of the frame. Locate a load cell or tension scale inline with the cable or cylinder. Complete attachment of the cable through pulleys and attach a weight holder or attach the other end of the cylinder to a stationary structure.

(2) Take the initial readings of frame position.

(3) Apply load to the frame and record load at each 0.25 inch frame movement. Continue to increase load up to specified value in Performance Criteria paragraph or 2.0 inches displacement is reached.

Note: Loading the frame beyond 2.0 inch deflection may result in permanent deformation of the frame.

(4) Record any observations of upright bowing, stress damage or base lifting. Videotape, photographs or other evidence of frame condition is required of loaded and unloaded frame.

(5) Repeat steps 1 through 4 for each of the axis, (front, back, one side)

(b) Vertical Loads

(1) Mount the frame to the floor as described in Mounting and Support paragraph. Vertical loads can be applied by hydraulic cylinder attached to top crossmember and on other end to the floor. Another method is to stack individual cast iron weights above crossmember or hang weights from crossmember.

(2) Measure and record the distance between uprights before the load is applied to the frame.

(3) Apply load to top crossmember gradually until the 1000 pounds is reached.

(4) Measure the deflection distance between the uprights and record.

(5) Remove the load and measure and record the distance between the uprights.

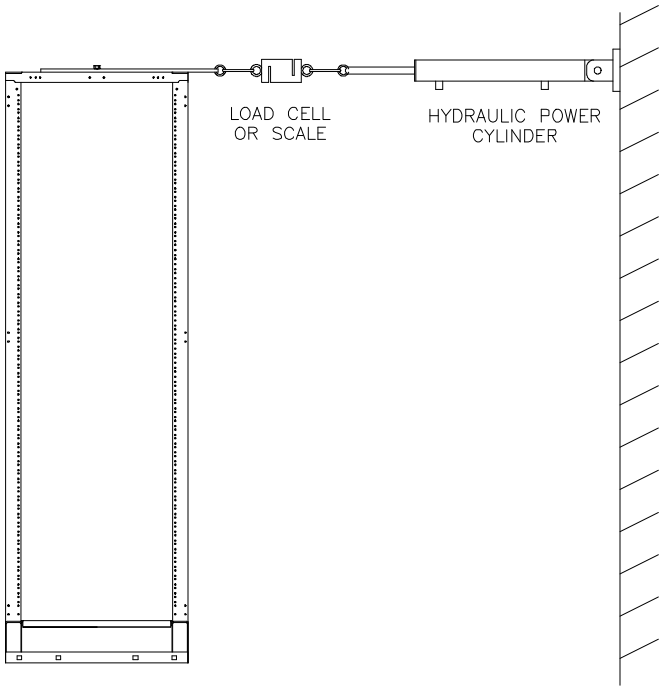
9. TEST RESULTS

A. General

9.01 The test results are to be submitted to Pacific Bell for each frame. The results must include manufacturer name, frame model number, tabulated data of tests, videotape or photographs of frame, assembly drawings of frame, baseplate, anchor hardware.

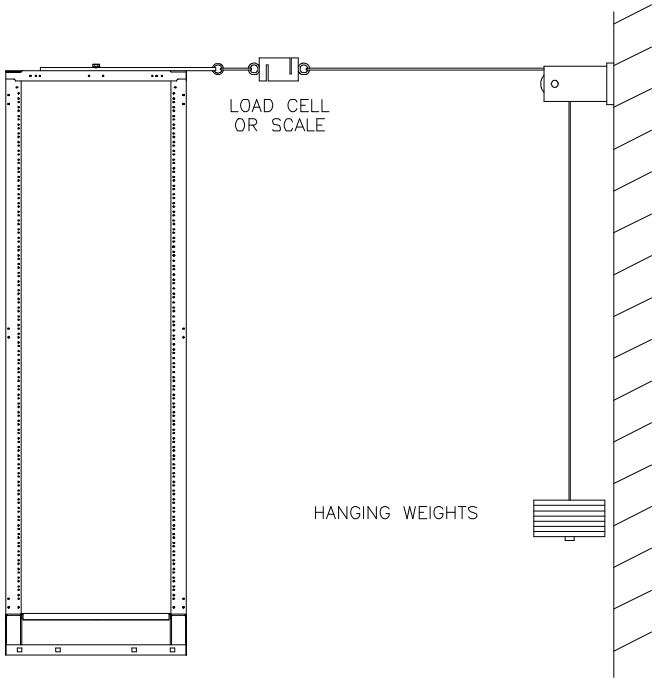
B. Contact

9.02 Questions on the test procedure or frame physical performance requirements should be addressed to Pacific Bell Seismic Protection Engineer, 925 823-4544, 2600 Camino Ramon, Room 4S450, San Ramon, CA 94583.



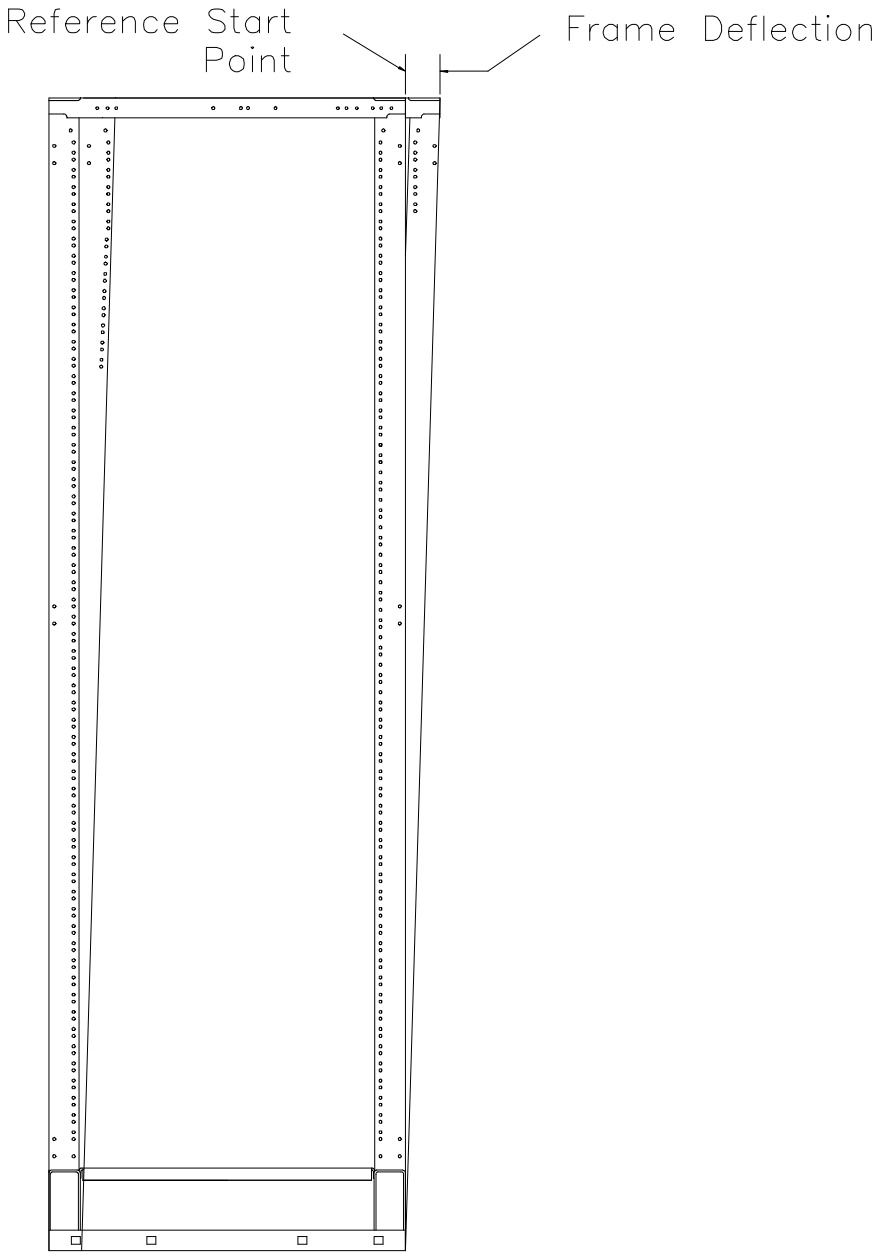
Hydraulic Cylinder Configuration

FIG. 1A



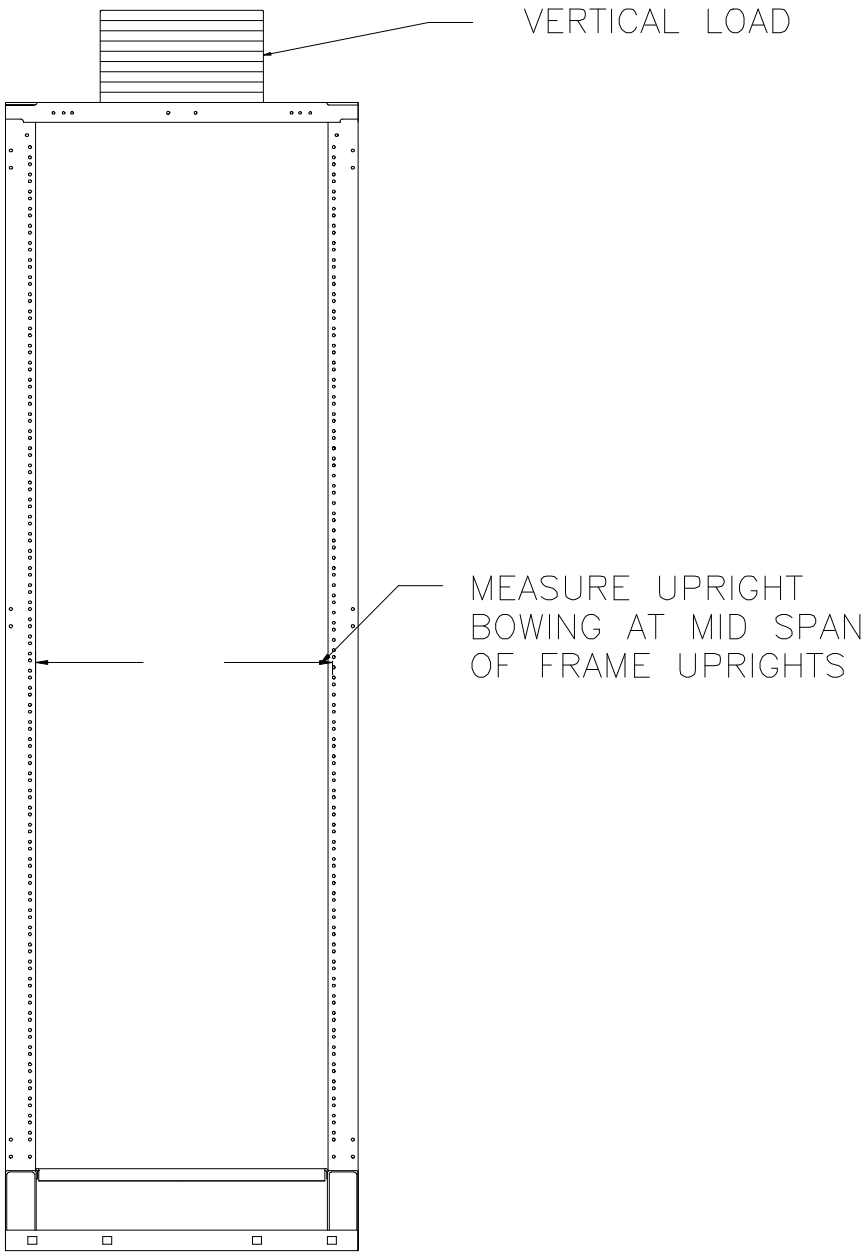
Hanging Weight Configuration

FIG. 1B



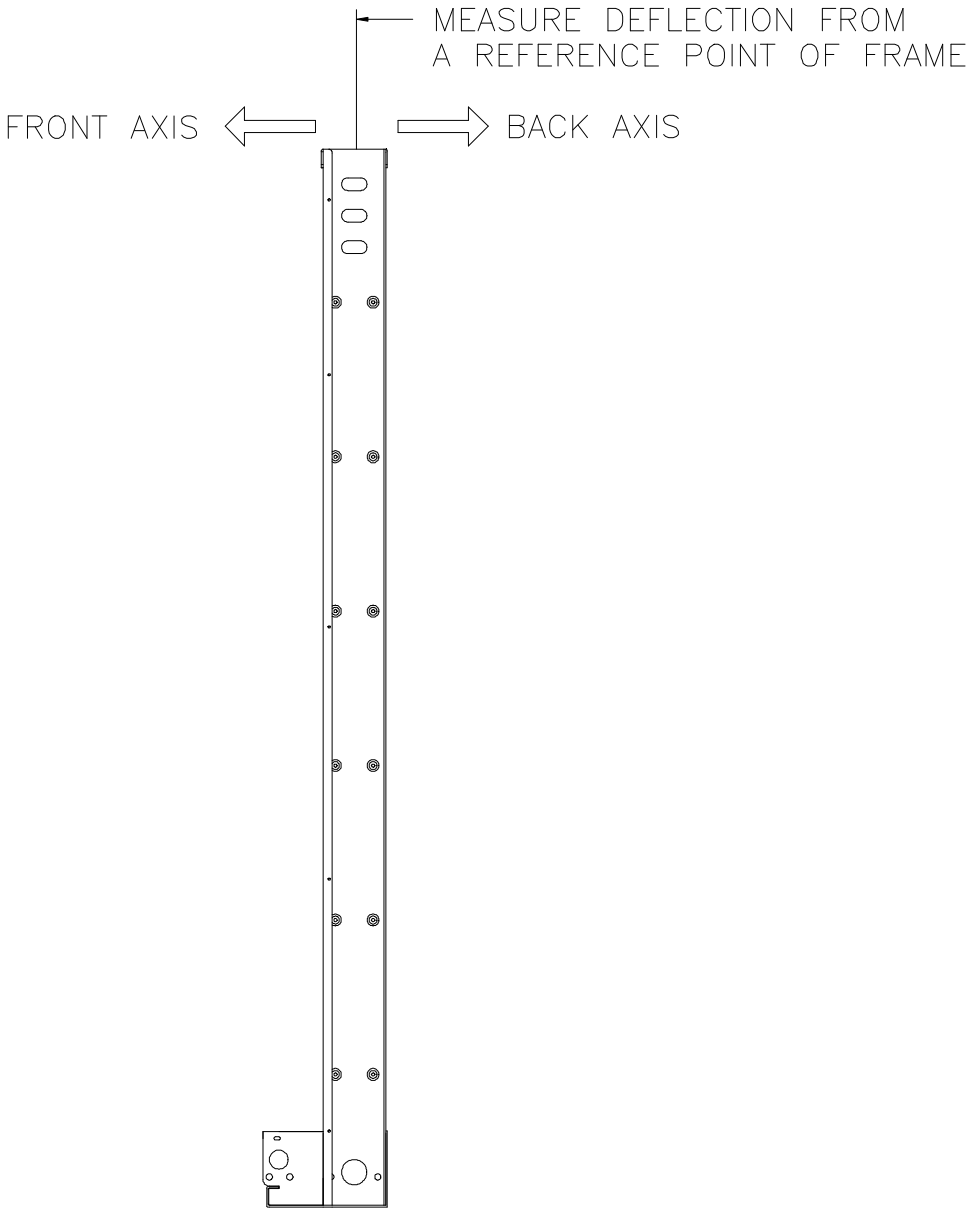
Lateral Load
Frame Deflection Measurement

FIG. 2



Vertical Load
Frame Bowing Measurement

FIG. 3



Lateral Load Front and Back Axis
Deflection Measurement

FIG. 4