SECTION 017100

CONSTRUCTION TOLERANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes tolerances for the structural frame and construction surveying requirements:

1. General contractor’s monitoring plan for the structural frame.
2. Vertical alignment tolerance.
3. Horizontal alignment tolerance.
4. Tolerance for embedded items.
5. Tolerance for cross-sectional dimensions of concrete elements.

B. Related Sections:

1. 013300 – Submittal Procedures
2. 014500 – Structural Testing, Inspection, and Quality Assurance
3. 031000 – Concrete Forming and Accessories
4. 032000 – Concrete Reinforcing
5. 033000 – Cast-in-Place Concrete
6. 051200 – Structural Steel Framing
7. 053100 – Steel Decking

1.3 REFERENCE STANDARDS

A. The latest versions of the publications listed below form a part of this specification; comply with provisions of these publications except as otherwise shown or specified.

1. American Concrete Institute: ACI 117 - Standard Specification for Tolerances for Concrete
2. American Institute of Steel Construction: AISC 303 - Code of Standard Practice for Steel Buildings and Bridges

1.4 SUBMITTALS

A. General: Make submittals in accordance with Section 013300, "Submittal Procedures."

B. General Contractor's Methods Description Narrative detailing the plan for surveying and monitoring of the structure during construction.

1. Narrative shall address all of the items described in Article 1.5 of this Section.
2. Narrative shall be submitted before steel or concrete preconstruction meeting and at least two weeks prior to the beginning of fabrication of the primary structural frame.

1.5 CONSTRUCTION TOLERANCE REQUIREMENTS

A. The General Contractor is responsible for constructing the building within tolerance. The tolerance of the structural frame shall be in accordance with the following industry standards, except where more stringent requirements are specifically noted in this Section.

1. American Concrete Institute: ACI 117 – Standard Specification for Tolerances for Concrete
2. American Institute of Steel Construction: AISC 303 - Code of Standard Practice for Steel Buildings and Bridges

B. Methods Description Narrative: The General Contractor shall prepare a Methods Description Narrative that shall address the following topics:

1. Survey procedures to monitor the drift and alignment of the structural frame.
2. Survey procedures to monitor deflection of composite floors. The General Contractor shall survey the deflection of the steel roof levels to monitor the deflection of the floor. Survey elevations shall be taken of the bottom flange of every beam and girder at each end and at quarter-points along the span. Survey shall be performed twice; once after steel is erected and again within 72 hours after the concrete slab is placed.
3. Survey procedures to monitor deflection of concrete floors. The General Contractor shall survey the deflection of the first instance of each typical level at a minimum to monitor the deflection of the floor. Survey elevations shall be taken at approximately 12 locations on these floors. Survey shall be performed of the top of formwork elevations prior to concrete placement, and of the top of slab elevations within 72 hours after the formwork is removed. Locations shall be mutually agreed upon by the Contractor and the Structural Engineer.
4. Shop fabrication methodology for adjustment of column length to account for column shortening, if necessary.
5. Executive summary of steel erection and fabrication quality control plans as related to construction tolerance.
6. Executive summary of concrete column and core wall quality control plan as related to construction tolerance and expected/historical concrete mix shrinkage properties for the mixes proposed to be used. The Contractor shall also coordinate with any required concrete mix shrinkage properties that are indicated on the drawings or in the specifications.
7. Description of fabrication and installation procedures for steel deck edge forms.

C. Vertical Alignment. The following tolerance limits shall apply to all vertical members such as walls and columns.

1. Figure 1 illustrates the tolerance for vertical alignment of columns and walls.
2. For vertical elements next to elevator openings: In addition to the tolerance limits shown in Figure 1, the reduction in the clear elevator hoistway dimension shall be limited to 2 inches total. See Figure 2.

D. Horizontal Alignment. The following tolerance limits shall apply to horizontal alignment (i.e., plan location) of horizontal elements of the structural frame such as slab edges, beams, and girders.

1. The variation in the horizontal alignment of the work points of a steel beam shall be acceptable if caused solely by variations in steel column or concrete core wall alignment that are within the limits of Paragraph 1.5C. See Figure 3 - Section at Slab Edge.
2. Edge forms for composite slabs shall be field installed to a tolerance of +/- 1 inch from the established building work lines. See Figure 3 - Section at Slab Edge.
3. Slab edge position tolerance of formed concrete slabs shall be in accordance with ACI 117.
4. The maximum offset in slab edge location between adjacent floors shall be +/- 3/8 inches. See Figure 3 - Offset Between Floors.

E. Steel Elements Embedded in Concrete. The following tolerance limits shall apply to the placement of steel elements of the structure embedded into concrete.

1. Weld plates or angles embedded into the concrete may be oversized at contractor's option. Placement tolerance of embedded items shall be of +/- 1 inch for both vertical and horizontal alignment.

2. In-and-out tolerance for embedded plates shall be 1/8 inch out of the concrete and 1/4 inch into the concrete (recess).

F. Cross-Sectional Dimensions of Concrete Elements. The following tolerance limits shall apply to the thickness of concrete elements such as walls, beams, and slabs.

1. The tolerance for slab thickness, including thickness of concrete on steel deck, shall be +3/8 inches and -1/4 inches.
2. The tolerance for cross-sectional dimension of concrete walls and beams shall be +1/2 inches and -3/8 inches.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION

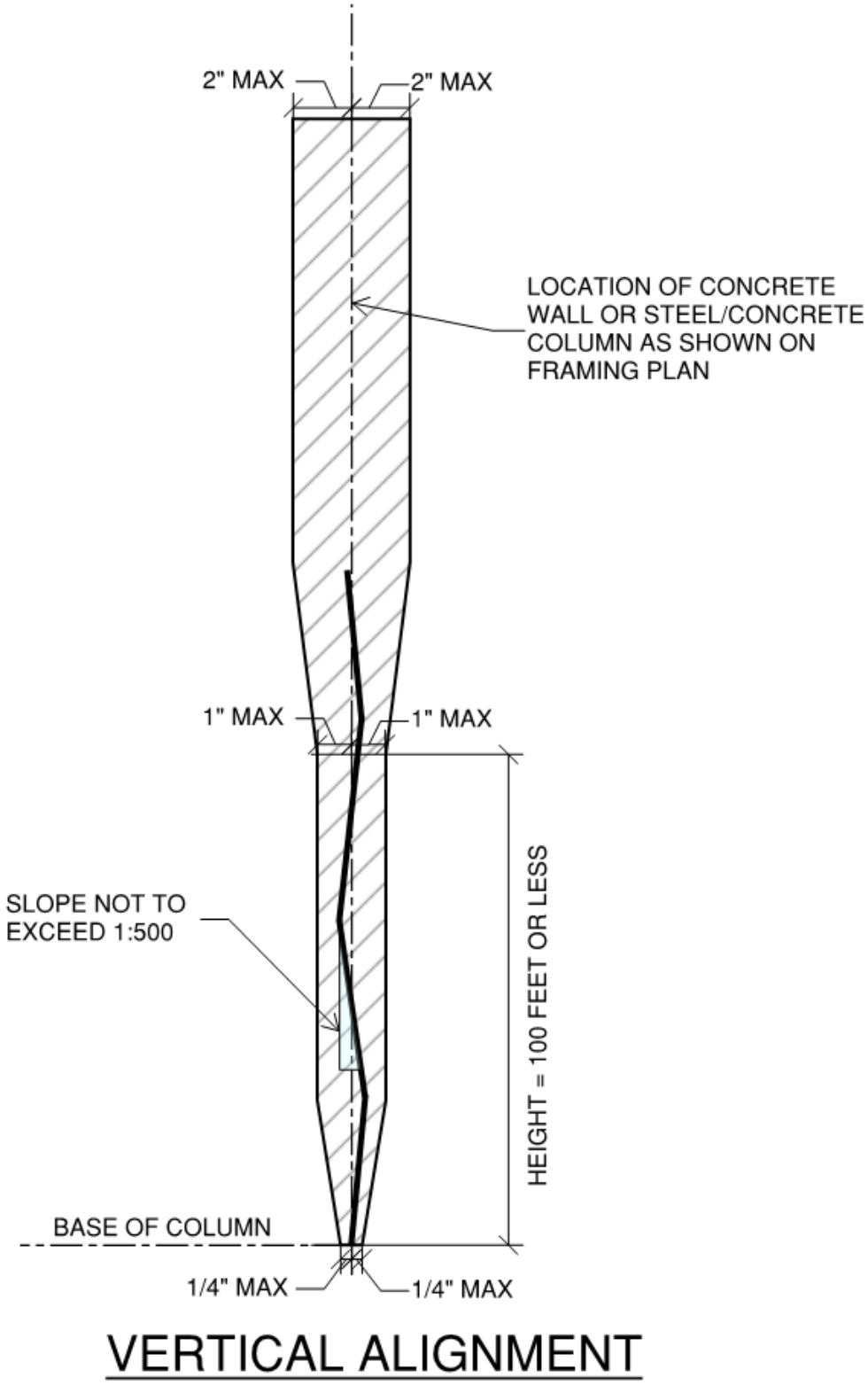
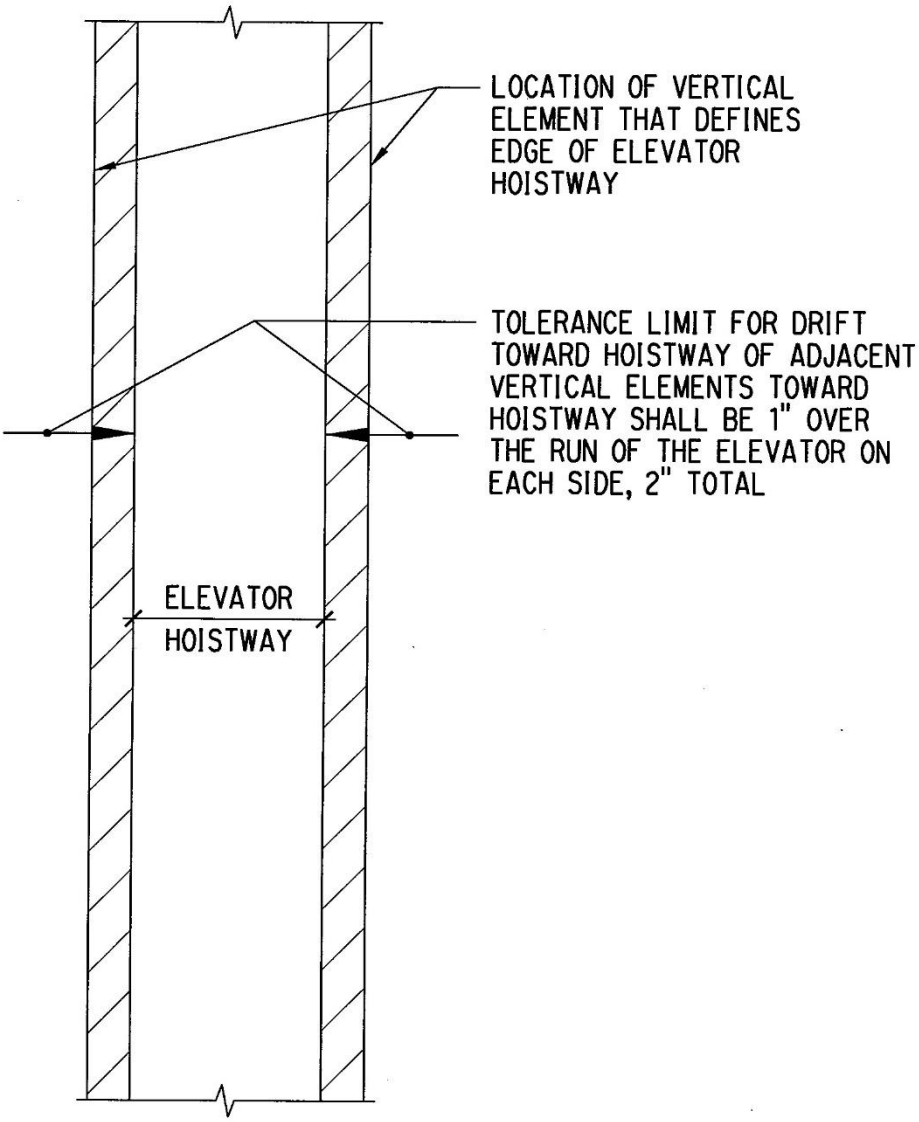


Figure 1: Vertical Alignment of Columns and Walls



VERTICAL ALIGNMENT

Figure 2: Vertical Elements at Elevator Openings

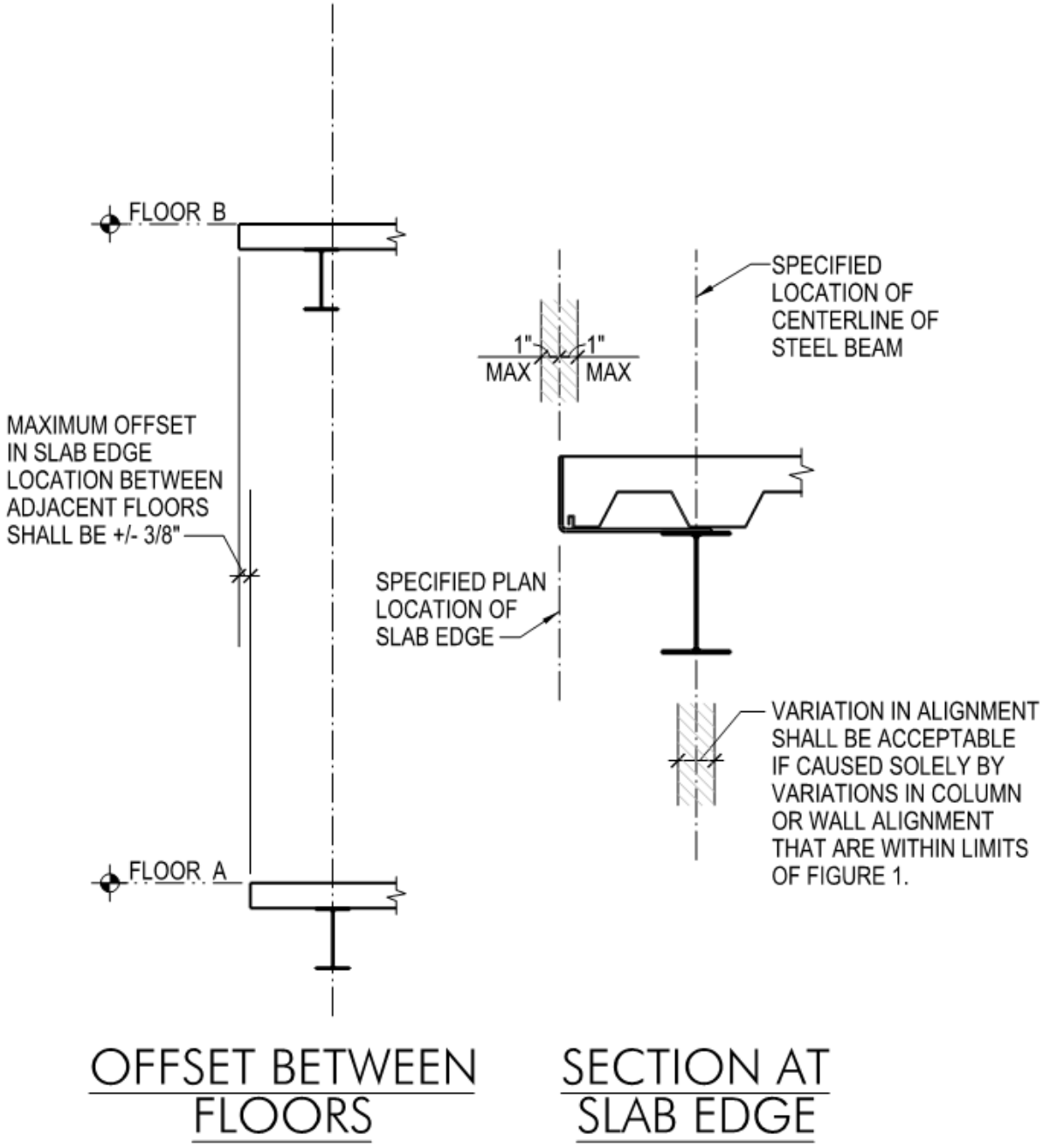


Figure 3: Horizontal Alignment

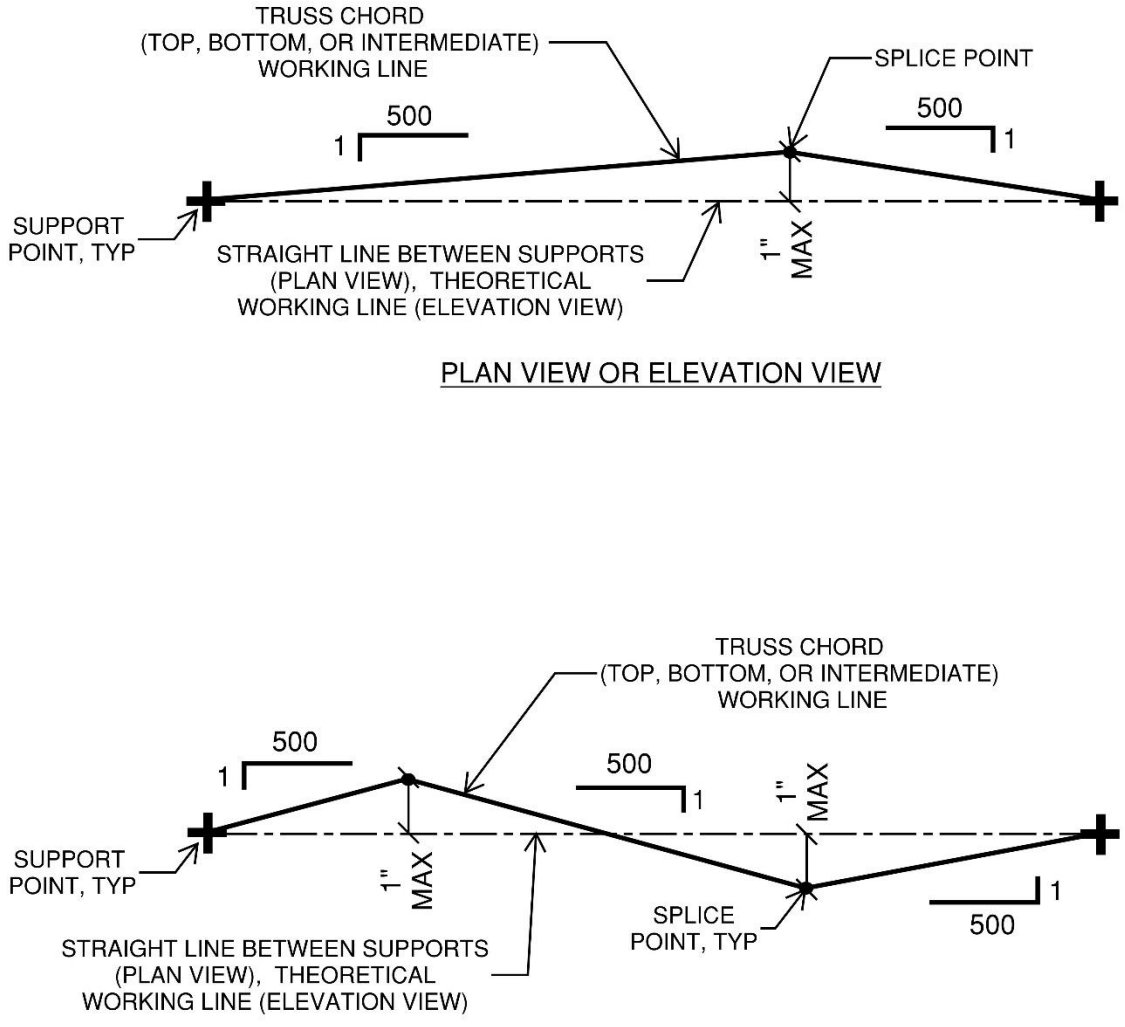


Figure 4: Vertical and Horizontal Alignment of Truss Chord Working Lines

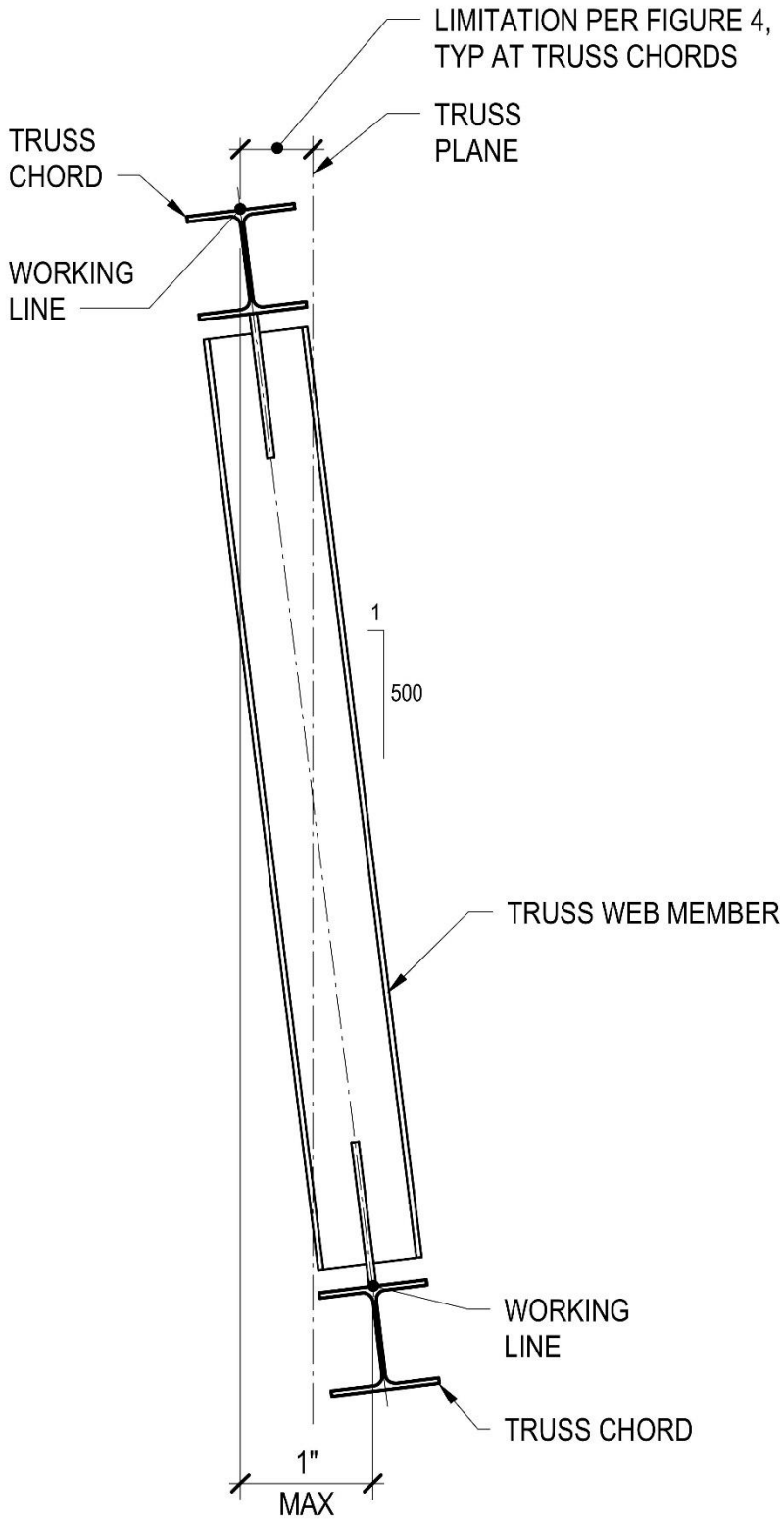


Figure 5: Vertical Alignment of Truss Chords