

**Specification for Tolerances  
for Precast Concrete**

An ACI Standard

Reported by ACI Innovation Task Group 7



**American Concrete Institute®**



First printing  
November 2009

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## Specification for Tolerances for Precast Concrete

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ISBN 978-0-87031-350-9

# Specification for Tolerances for Precast Concrete

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Reported by ACI Innovation Task Group 7

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*This Reference Specification provides standard tolerances for precast concrete construction. It covers dimensional tolerances for precast concrete members used in building construction, and it covers erection tolerances for these members. This document is intended to be adopted by reference in Contract Documents. The Specifier supplements the provisions of this Reference Specification as needed by specifying project-specific requirements in Contract Documents.*

**Keywords:** alignment; construction; erection tolerances; precast concrete; prestressed concrete; product tolerances; reinforcement; specification.

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ACI ITG-7-09 was adopted August 13, 2009 and published November 2009.  
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(mandatory portion follows)

## SECTION 1—GENERAL REQUIREMENTS

### 1.1—Scope

**1.1.1 Work specified**—This Specification designates standard tolerances for structural and architectural precast concrete members. Tolerances are provided for individual members and their erection. The indicated tolerances govern unless otherwise specified.

**1.1.2 Work not specified**—Interface tolerances between precast concrete members and cast-in-place concrete construction are specified in ACI 117.

**1.1.3 Units**—Values in this specification are stated in inch-pound units. A companion specification in SI units is also available.

### 1.2—Requirements

**1.2.1 Accumulation of tolerances**—Tolerances are not cumulative. Accumulations of individual tolerances on a single item shall not be used to increase an established tolerance. Individual tolerances are unique to their specific application and shall not be combined with other tolerances to form a tolerance envelope. The most restrictive tolerance controls.

**1.2.2 Sign definition**—Plus (+) tolerance increases the dimension or elevation to which it applies. Minus (–) tolerance decreases the dimension or elevation to which it applies.

**1.2.3 Exceeding tolerances**—If the product and erection tolerances in this document are exceeded, the member or the modified assembly shall be accepted if the following conditions are met:

(a) The Licensed Design Professional determines that the structural requirements have been satisfied.

(b) The Owner or Architect accepts the appearance of exposed surfaces.

### 1.3—Definitions

**Architect/Engineer**—the architect, engineer, architectural firm, or engineering firm developing Contract Documents or administering the Work under Contract Documents, or both.

**bearing width overhang**—distance from the side of precast concrete member to side of bearing media, that is, pad or shim, measured perpendicular to the direction of the span, as shown in Fig. 1.1.

**blockout**—opening through the member for conduit, piping, ductwork, connections, or structural framing.

**bowing**—the deviation of the edge or surface of a planar wall member, in the out-of-plane direction, from a line passing through any two corners of the member, as shown in Fig. 1.2.

**camber**—deviation of the bottom of the member from a line between the bottom ends of that member due to the effects of the prestress force.

**Contract Documents**—a set of documents supplied by Owner to Contractor as the basis for construction; these documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.

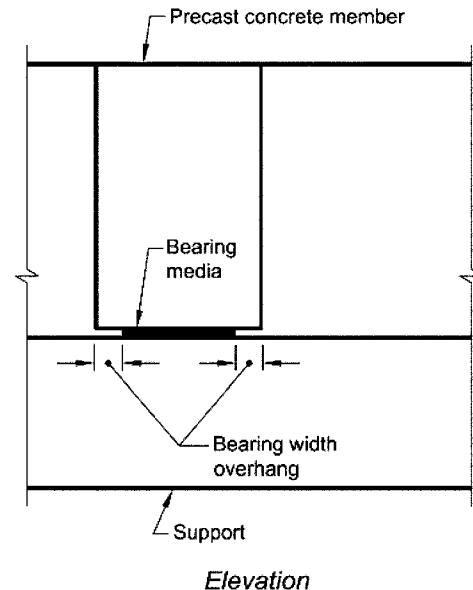
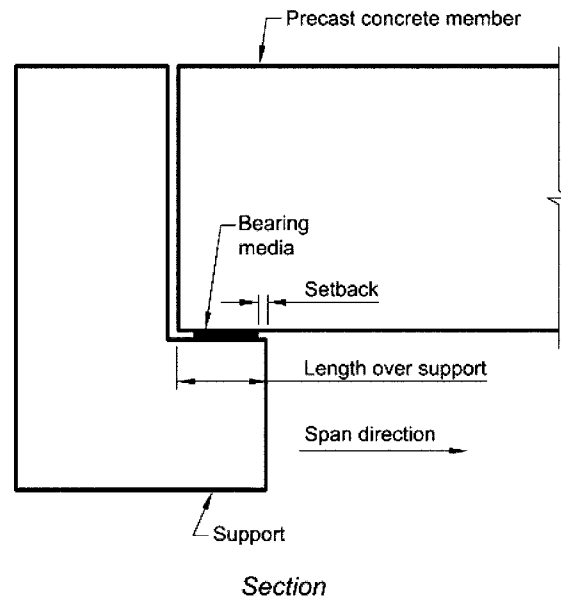


Fig. 1.1—Length over support and bearing width overhang.

**control surface, primary**—the member surface deemed to be critical to the fit and function of interfacing members or to the appearance of the completed project.

**cover**—the least distance between the surface of embedded reinforcement and the surface of the concrete.

**deviation**—distance from an established reference point, line, or surface measured perpendicular to the line or surface of the member.

**deviation from plane**—distance between a point on a reference plane and the corresponding point on the actual surface of the member.

**deviation, horizontal**—distance from an established point, line, or surface measured perpendicular to a vertical line through the point of interest.

**deviation, vertical**—distance from an established point, line, or surface measured perpendicular to a horizontal line through the point of interest.

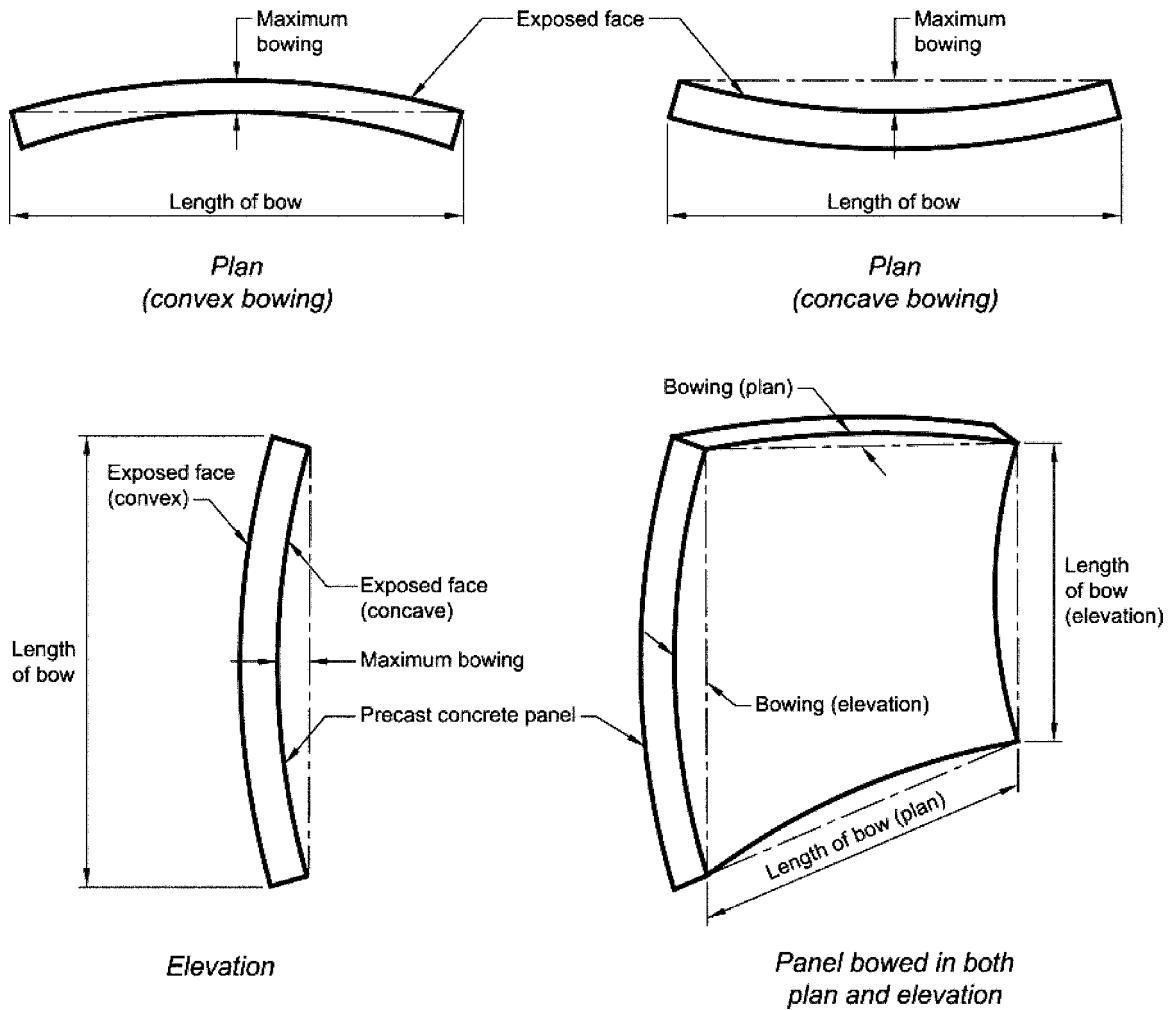


Fig. 1.2—Panel bowing.

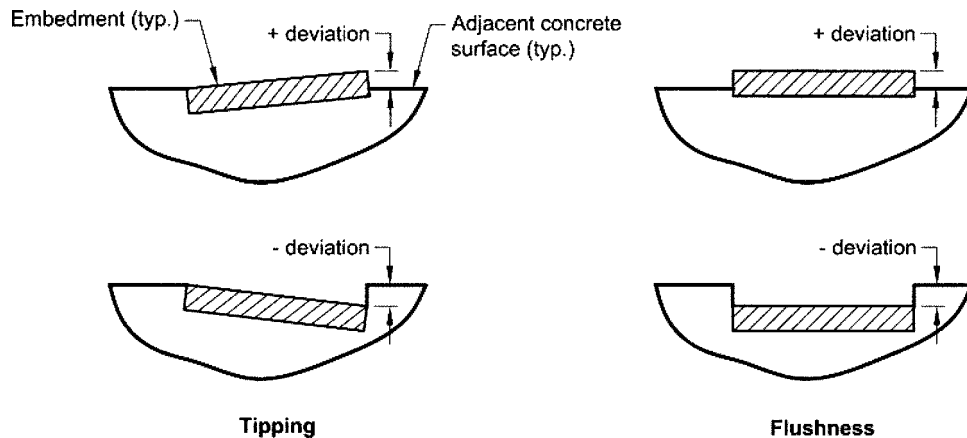


Fig. 1.3—Tipping and flushness.

**embedment**—item embedded in the concrete to transmit applied loads to the structure.

**exposed**—intended by the Contract Documents to be visible during normal occupancy.

**flushness**—deviation of the embedment surface from the surrounding adjacent concrete surface, as shown in Fig. 1.3.

**insert**—an embedment that uses a threaded device or strap anchor to connect the member to the surrounding structure or other work.

**length over support**—length of precast member over the support measured in the direction of the span, as shown in Fig. 1.1.

**Licensed Design Professional**—an individual who is licensed to practice structural design as defined by the

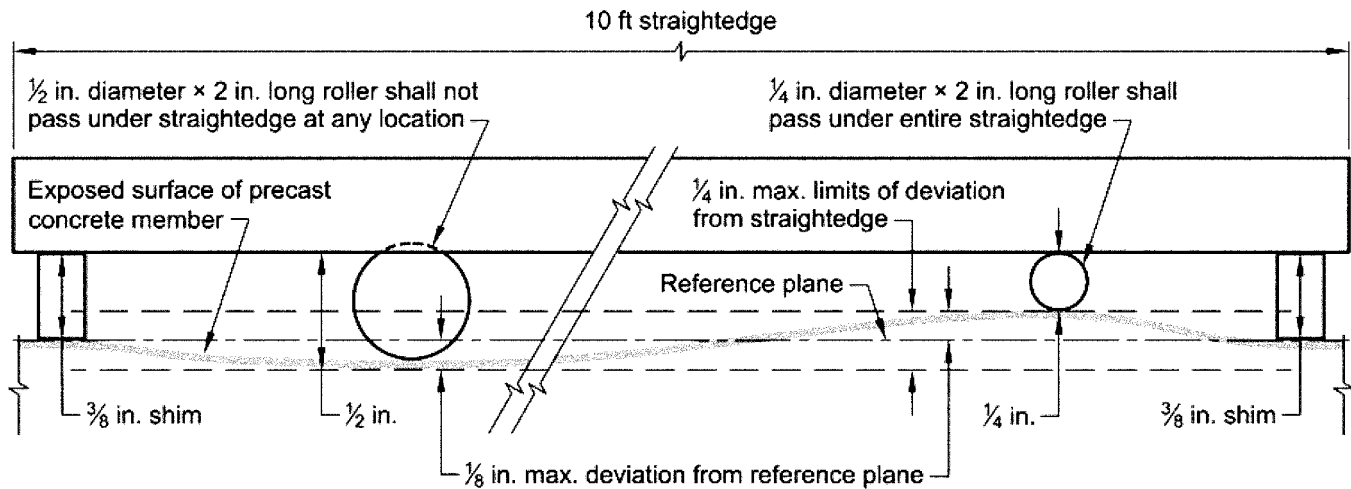


Fig. 1.4—Roughness.

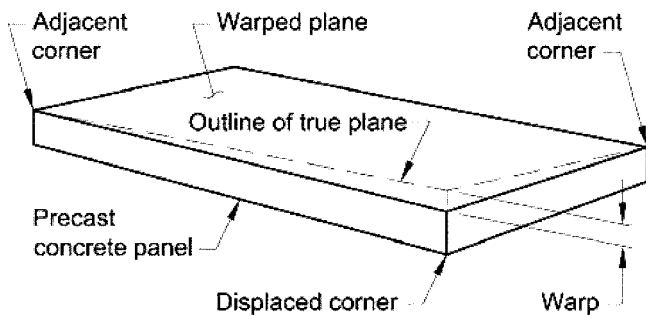


Fig. 1.5—Panel warping.

statutory requirements of the professional licensing laws of the state or jurisdiction in which the project is to be constructed and who is in responsible charge of the structural design.

**opening, finished**—an opening through a member that will be visible and requires additional finishing to the as-cast concrete surfaces and edges.

**opening, rough**—opening through a member that accepts a frame for a window, door, louver, hatch, or similar device.

**Owner**—the corporation, association, partnership, individual, public body, or authority for whom the Work is constructed.

**pretopped**—a manufactured precast concrete member that does not require a field-placed concrete topping.

**Project Drawings**—graphic presentation of project requirements.

**product, nonstructural architectural**—precast concrete member that is visually exposed in the finished Work; does not support any horizontal structural members; and is not part of the lateral force-resisting system.

**product, structural**—precast concrete member that is part of the structural framing system and is designed to resist imposed loads in addition to self-weight.

**roughness**—the variation in the deviation of an exposed surface from a local reference plane, as shown in Fig. 1.4.

**setback**—distance from edge of support to the bearing media, that is, pad or shim, as shown in Fig. 1.1.

**spandrel**—precast concrete members that are less than a story in height, have a height to web thickness ratio of 3 or greater, and span horizontally between supports.

**spanning member**—a horizontal member supported at or near the ends.

**specified**—required by the Contract Documents.

**sweep**—deviation of a longitudinal edge, of a horizontal or vertical member, from a line through the ends of that edge.

**tipping**—the deviation from plane of one or both edges of an embedment, as shown in Fig. 1.3.

**tolerance**—the permitted deviation from a specified dimension, location, line, or plane.

**unarmored edge**—the corner, in section view, of a concrete support member unprotected by a steel embedment.

**warping**—deviation of a planar surface due to displacement of one corner in relation to any two adjacent corners, as shown in Fig. 1.5.

**Work**—the entire construction or separately identifiable parts thereof required to be furnished under Contract Documents.

**wythe**—the concrete layer of an insulated wall panel, between a panel face and the nearest surface of the sandwiched insulation, measured perpendicular to the face of the panel.

#### 1.4—Referenced standards

Standards of ACI referred to in this Specification are listed with serial designation including year of adoption or revision.

*American Concrete Institute*

117-06 Specifications for Tolerances for Concrete Construction and Materials and Commentary

This publication may be obtained from this organization:

American Concrete Institute  
38800 Country Club Drive  
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www.concrete.org







**Table 2.1—Product tolerances for structural members (cont.)**

Product tolerance	Product type											
	Single tee (Fig. 2.1)	Double tee (Fig. 2.2)	HC slab (Fig. 2.3)	Joist (Fig. 2.4)	Beam and spandrel (Fig. 2.5)	Column (Fig. 2.6)	Ribbed wall panel (Fig. 2.7)	Flat wall panel (Fig. 2.8)	HC wall panel (Fig. 2.9)	Step unit (Fig. 2.10)	Stadium riser (Fig. 2.11)	Room module (Fig. 2.12)
<i>a. Sleeve breakout</i>												
±1 in.	•	•										
<i>b. Skew of a sleeve breakout</i>												
±1/2 in.	•	•										
<i>c. Rotation (where breakout is visible). Distance is measured at perimeter</i>												
2 degrees, ±1/4 in. maximum												•
<b>24. Deviation from specified size of a breakout</b>												
±1/2 in.	•	•	•		•		•	•	•		•	
<b>25. Deviation from specified location of an exposed breakout, rough opening, or finished opening</b>												
±1 in.					•		•	•				
<b>26. Deviation from specified size of a rough opening</b>												
±1/8 in.												•
±1 in.					•		•	•				
<b>27. Deviation from specified size of a finished opening</b>												
±1/2 in.					•		•	•				
<b>28. Deviation from specified horizontal line or plane (sweep)</b>												
±3/8 in.			•					•				
±1/8 in. per 10 ft, ±1/2 in. maximum						•						
±1/8 in. per 20 ft, ±3/8 in. maximum								•				
±1/4 in. per 40 ft, ±3/8 in. maximum											•	
<40 ft, ±1/4 in.	•	•			•		•					
<40 ft, ±3/8 in.					•							
>40 ft, ±3/8 in.							•					
40 ft to 60 ft, ±3/8 in.	•	•										
40 ft to 60 ft, ±1/2 in.					•							
40 ft to 60 ft, ±5/8 in.					•							
>60 ft, ±1/2 in.	•	•										
>60 ft, ±5/8 in.					•							
>60 ft, ±3/4 in.					•							
<b>29. Deviation from plane of concrete surface between embedments</b>												
-1/4 in., +0 in.							•	•				
<b>30. Deviation from specified location of an insert (any direction)</b>												
±3/8 in.										•		•
±1/2 in.	•	•			•	•	•	•			•	
<b>31. Deviation from specified location of a bearing plate</b>												
±1/2 in.	•	•			•	•					•	
<b>32. Deviation from specified location of an embedment (any direction)</b>												
±1/2 in.												•
±1 in.	•	•			•	•	•	•	•	•	•	
±1 in., ±2 in.			•									
<i>a. Rotation (where embedment visible). Distance is measured at perimeter</i>												
2 degrees, ±1/4 in. maximum												•
<i>b. Depth of recess</i>												
+1/4 in., -1/8 in.												•
<b>33. Deviation from plane of an embedment (tipping and flushness)</b>												
±1/8 in.										•		•
±1/4 in.	•	•	•	•	•	•	•	•	•		•	

**Table 2.1—Product tolerances for structural members (cont.)**

Product tolerance	Product type											
	Single tee (Fig. 2.1)	Double tee (Fig. 2.2)	HC slab (Fig. 2.3)	Joist (Fig. 2.4)	Beam and spandrel (Fig. 2.5)	Column (Fig. 2.6)	Ribbed wall panel (Fig. 2.7)	Flat wall panel (Fig. 2.8)	HC wall panel (Fig. 2.9)	Step unit (Fig. 2.10)	Stadium riser (Fig. 2.11)	Room module (Fig. 2.12)
<b>34. Deviation from plane of a bearing plate (tipping and flushness)</b>												
±1/8 in.	•	•		•	•						•	
<b>35. Deviation from specified position of reinforcement</b>												
±1/4 in. (individual strand)	•	•		•	•	•	•	•			•	
±1/4 in. (C.G. of group)			•					•				
±1/2 in. (bundled strands)	•	•		•	•	•						
<i>a. Perpendicular to plane of member</i>												
±1/4 in.								•				
±1/2 in.			•					•				
<i>b. Parallel to plane of member</i>												
±3/4 in.			•					•				
±1 in.								•				
<i>c. Cover</i>												
±1/4 in.												•
<b>36. Deviation from specified design camber<sup>†</sup></b>												
±1/4 in. per 10 ft, ±3/4 in. maximum	•	•		•								
±1/8 in. per 10 ft, ±3/4 in. maximum					•							
±1/4 in. per 10 ft, ±1/2 in. maximum										•		
<b>37. Deviation from specified location of a stirrup</b>												
<i>a. Projection</i>												
±1/4 in., -1/2 in.				•	•							
<i>b. Longitudinal spacing at ends within a distance equal to the depth of the member</i>												
±1 in.				•	•							
<i>c. Longitudinal spacing</i>												
±2 in.				•	•							
<b>38. Deviation from specified location of flashing reglet</b>												
±1/4 in.							•	•				
<b>39. Deviation from specified location of a rustication or architectural feature</b>												
±1/8 in.								•				
<b>40. Deviation from specified size of a rustication or architectural feature</b>												
±1/8 in.								•				
<b>41. Deviation from specified location of an electrical box or any accessory of another trade</b>												
±1 in.												•

<sup>\*</sup>See Fig. 2.13 for determination of the flange and web thicknesses. The specified flange and web thicknesses are provided by the hollowcore producer’s standard cross section.

<sup>†</sup>Specified design camber from prestressed concrete design calculations.

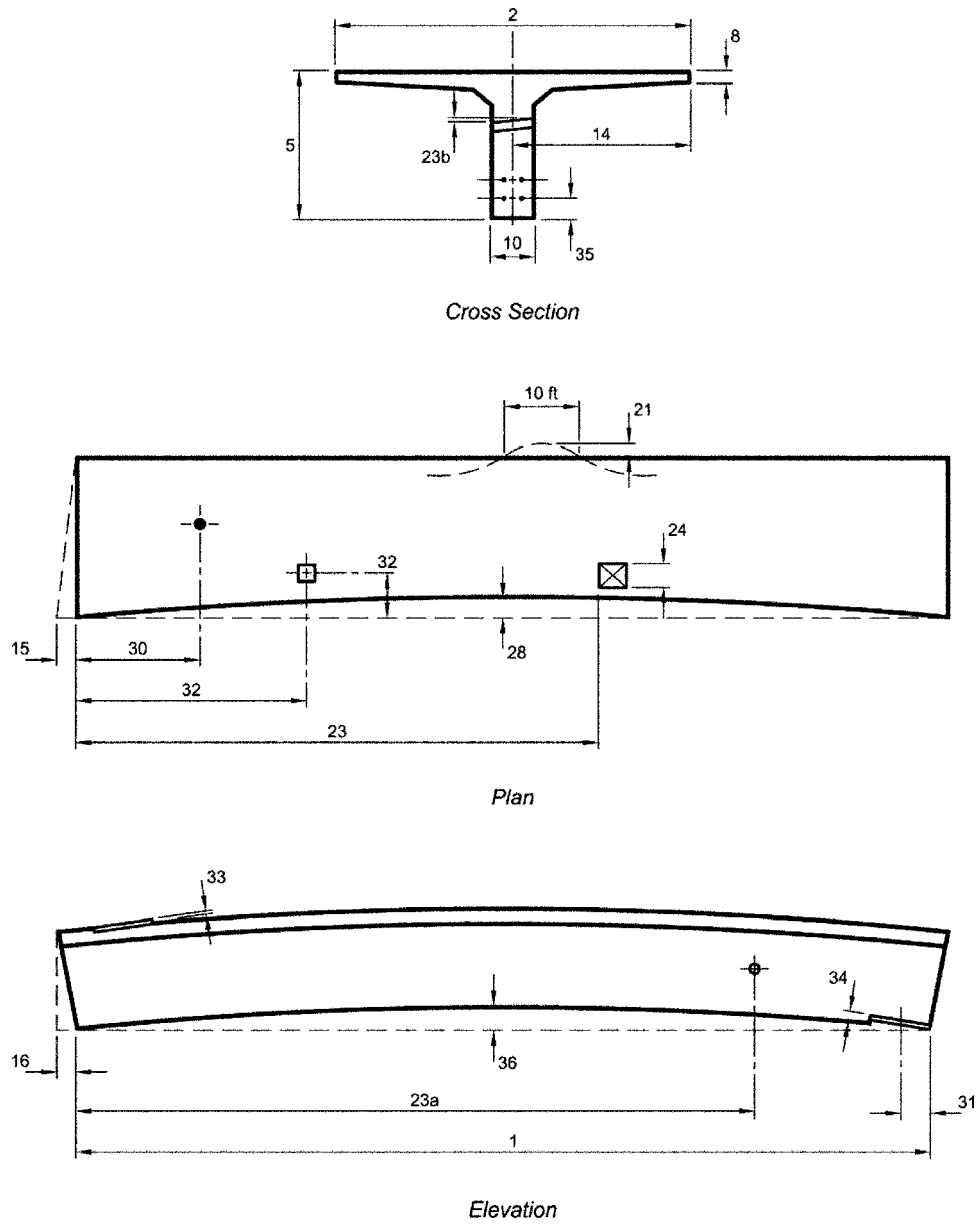


Fig. 2.1—Product deviation: single tee.

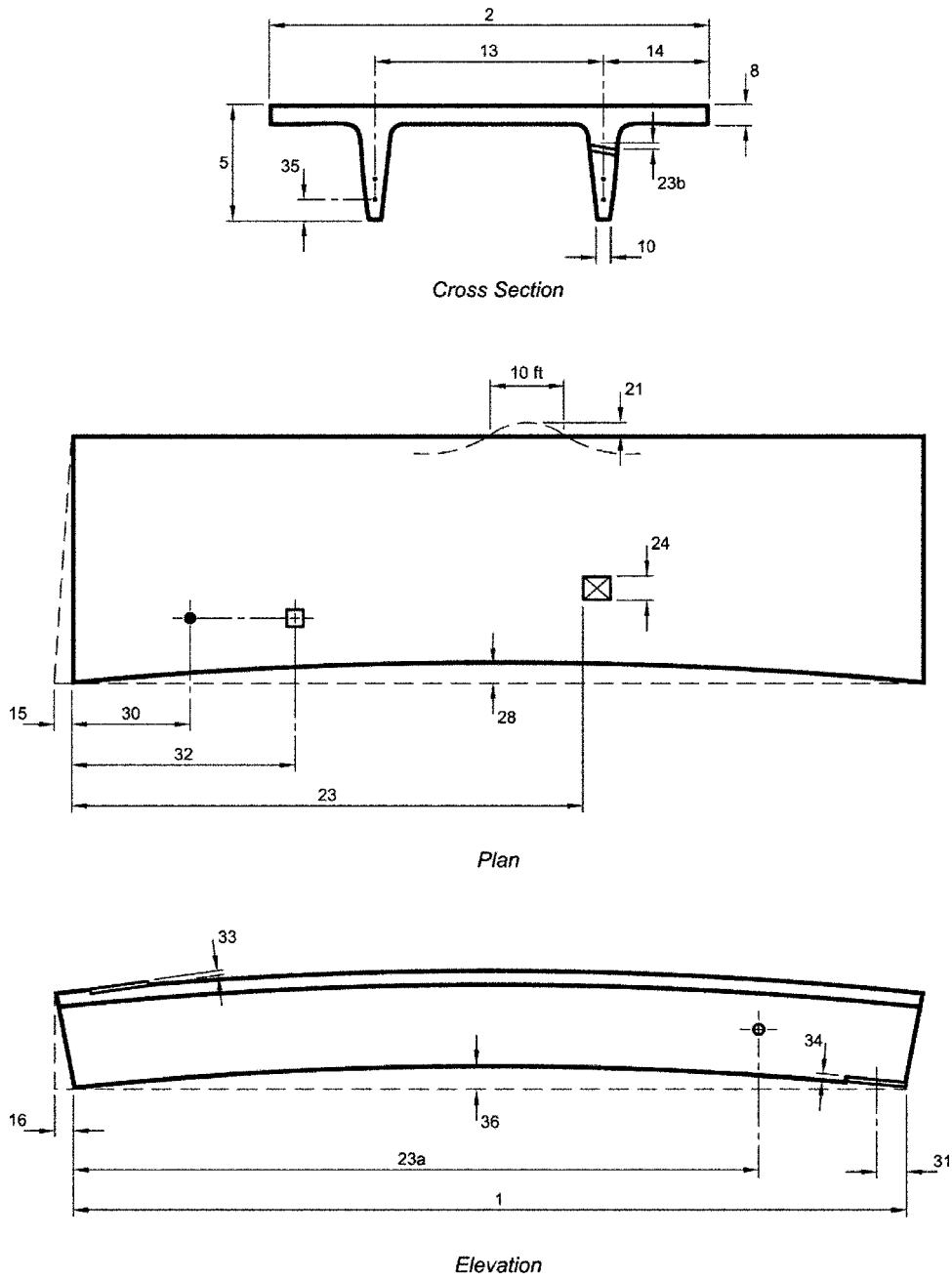


Fig. 2.2—Product deviation: double tee.

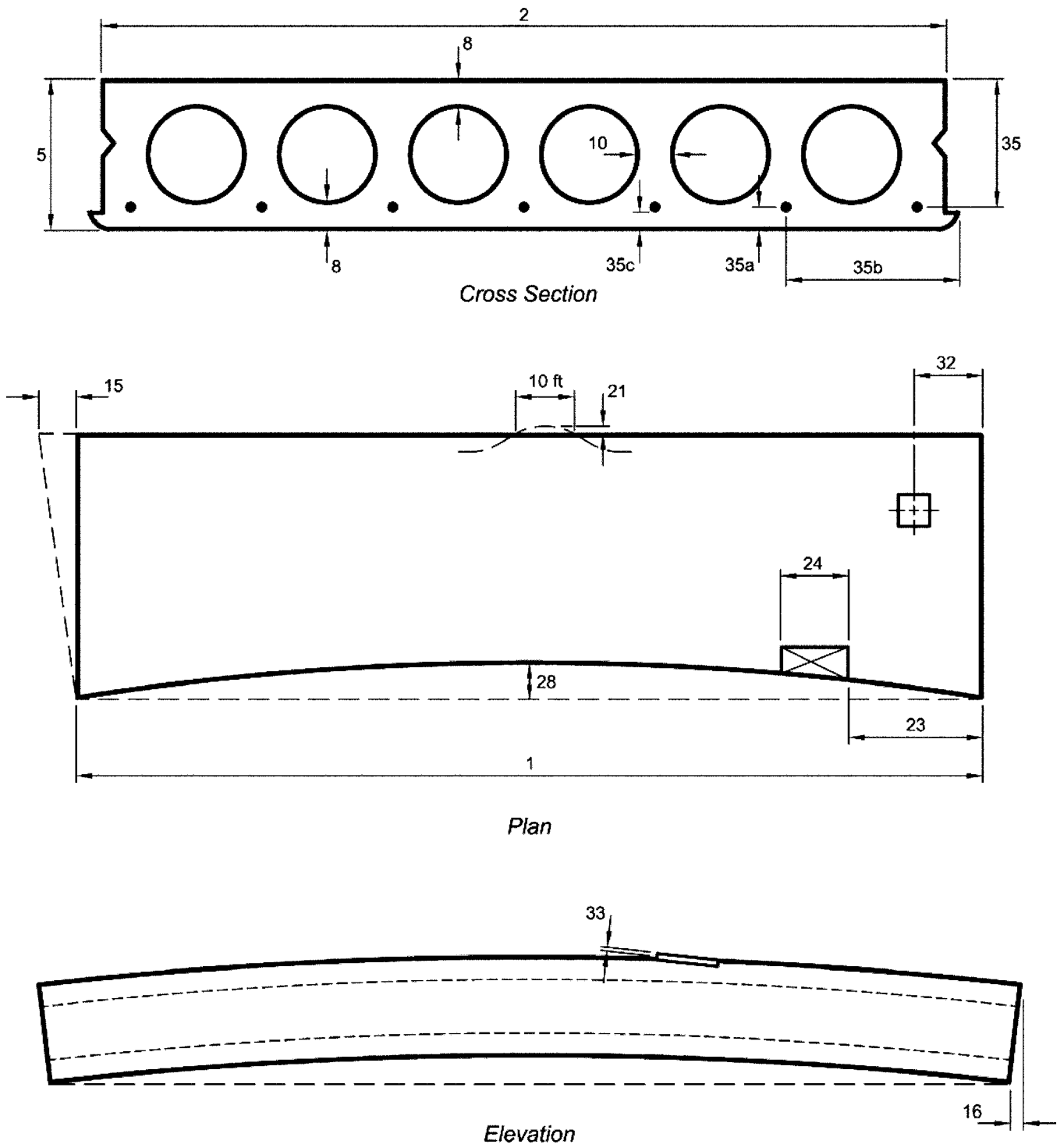
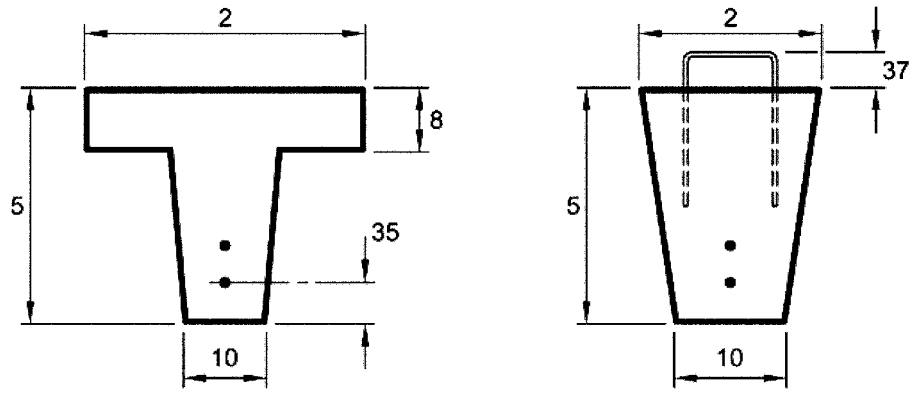
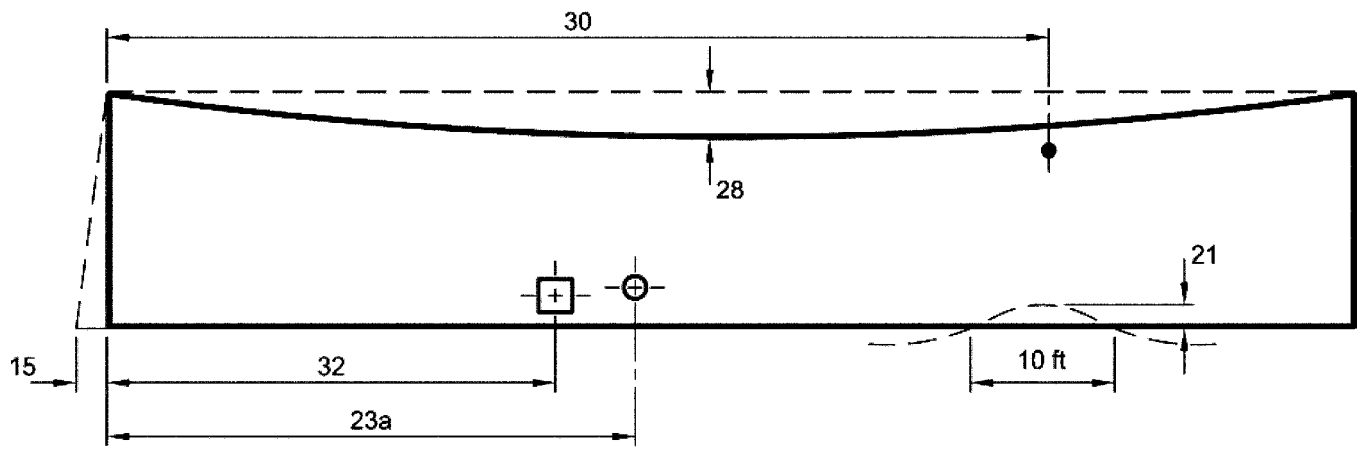


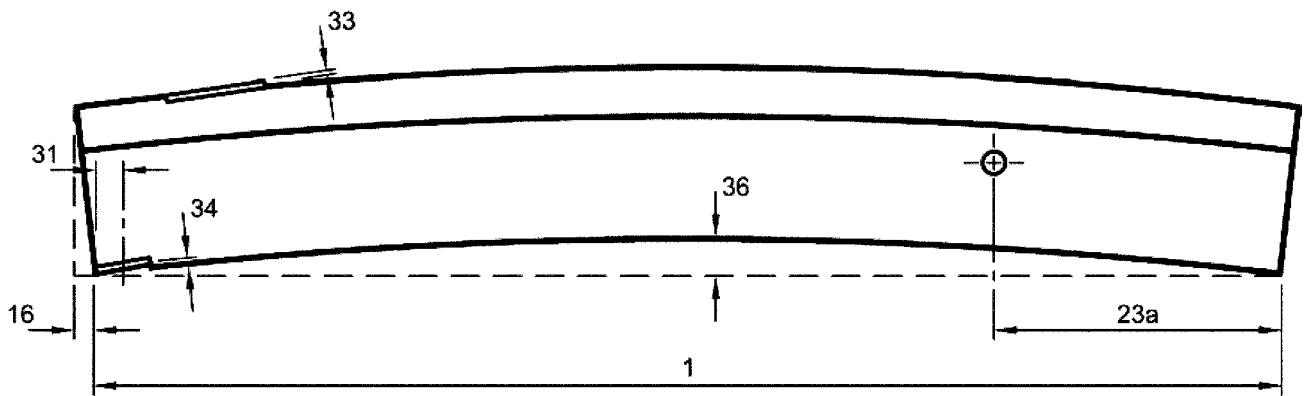
Fig. 2.3—Product deviation: hollow core slab.



Cross Sections



Plan



Elevation

Fig. 2.4—Product deviation: joist.

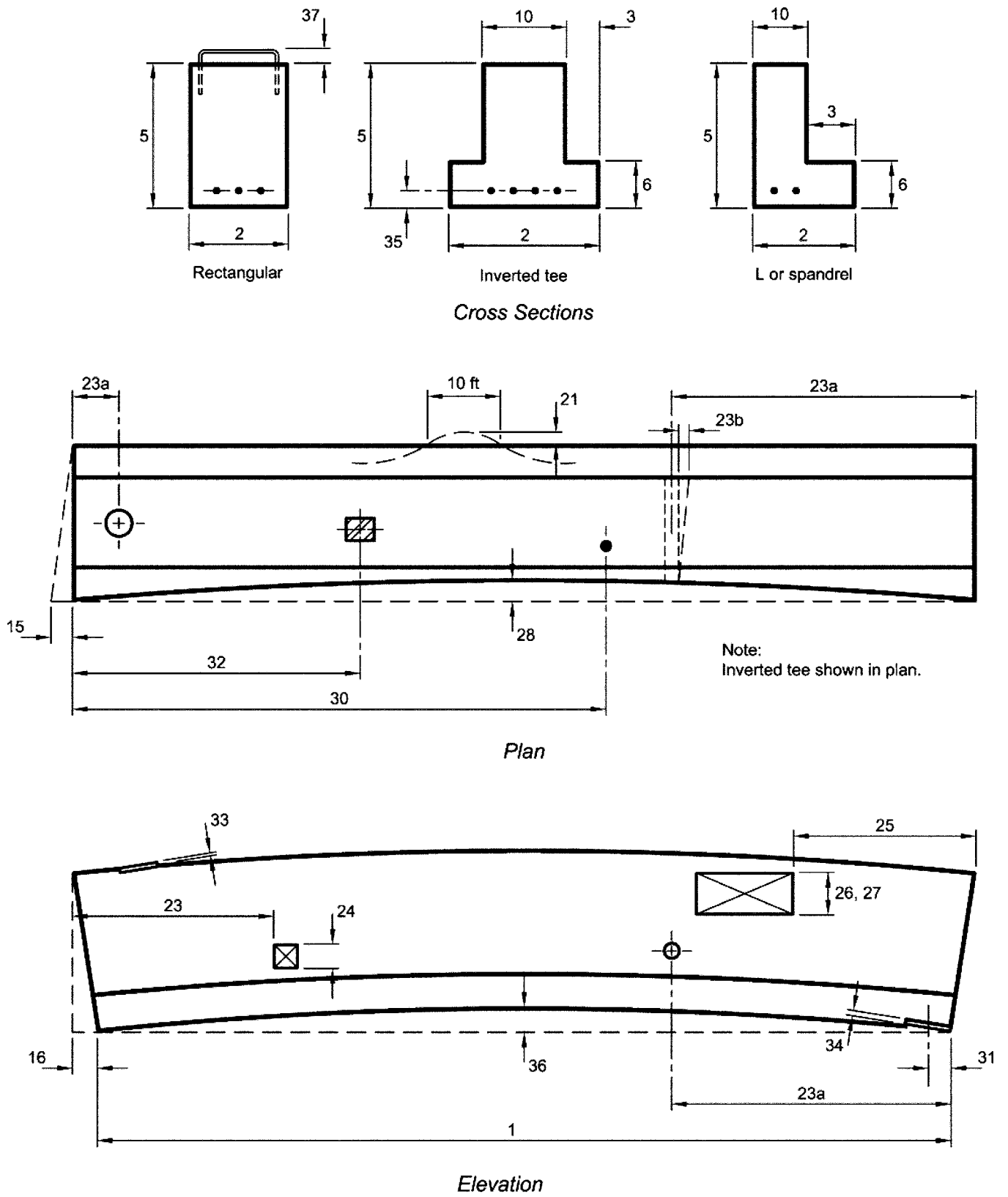


Fig. 2.5—Product deviation: beam and spandrel.

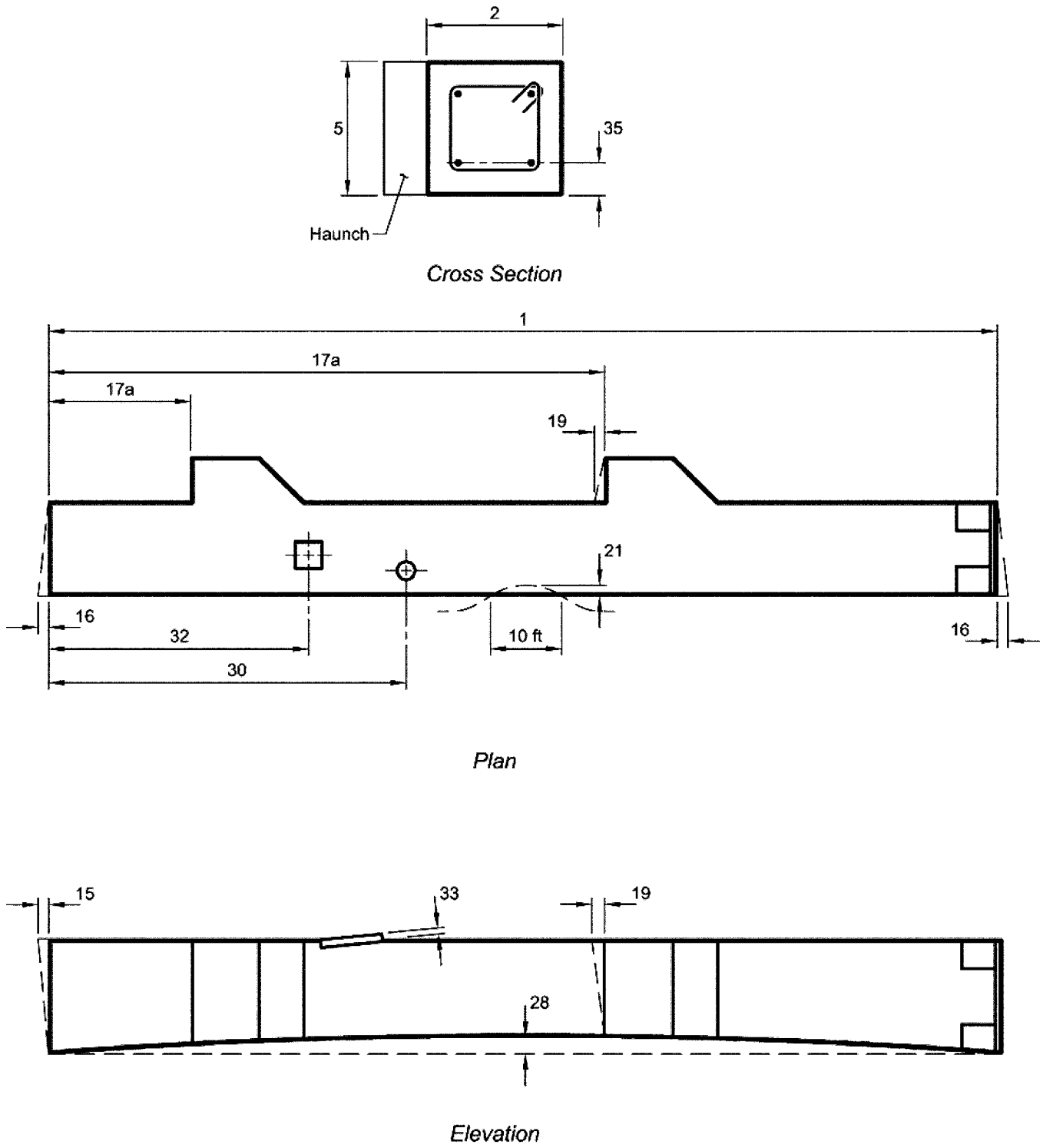


Fig. 2.6—Product deviation: column.



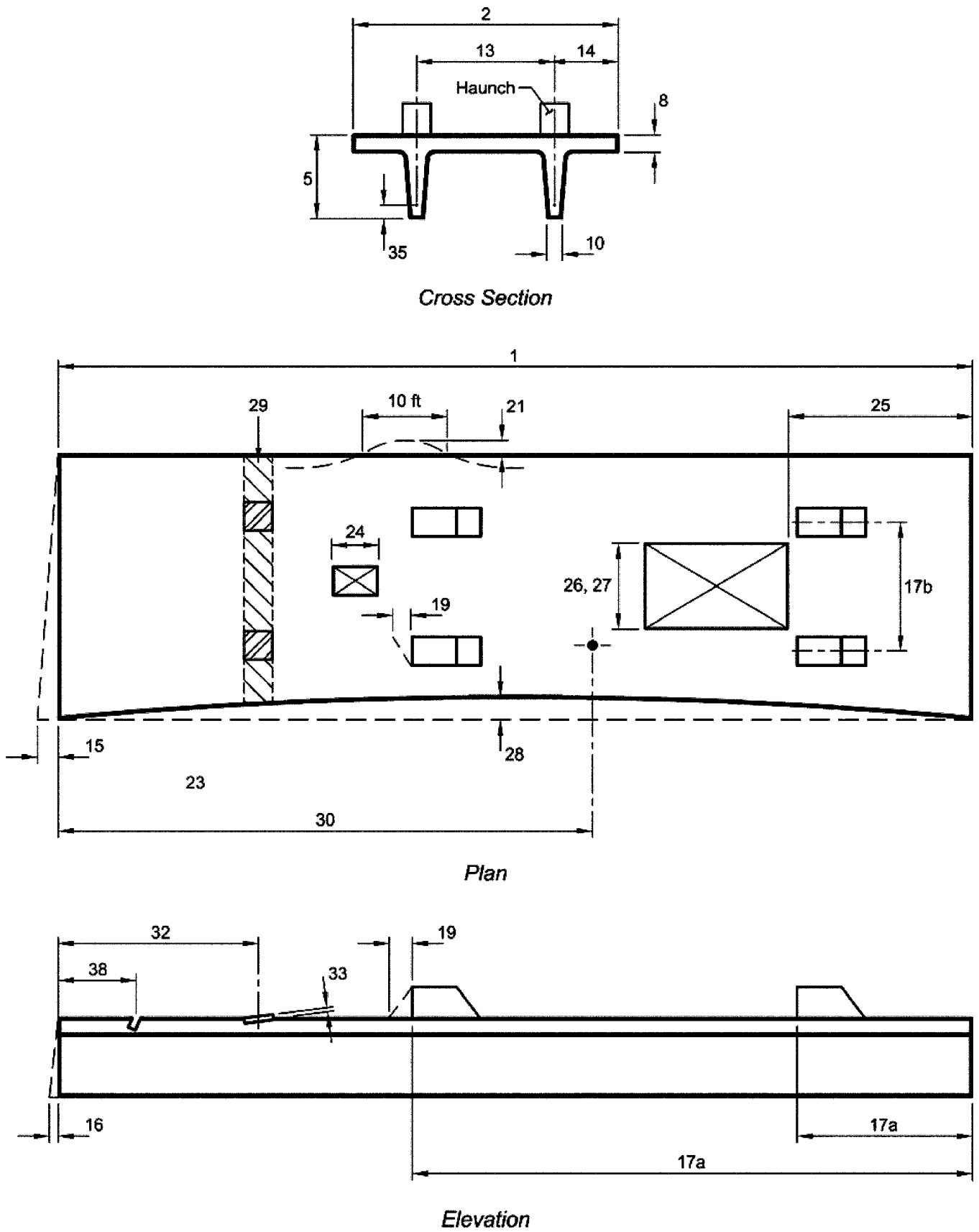
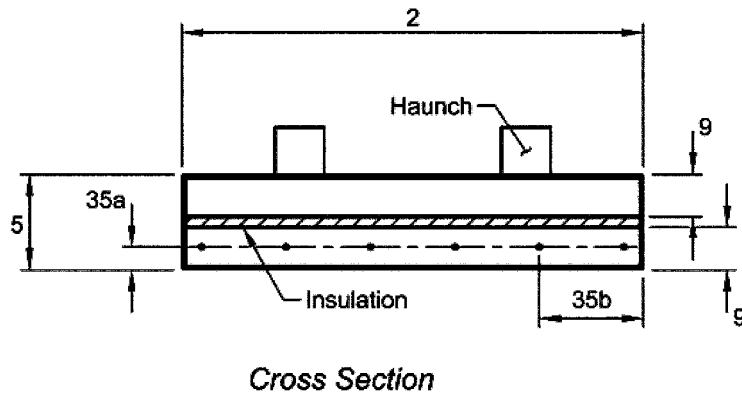
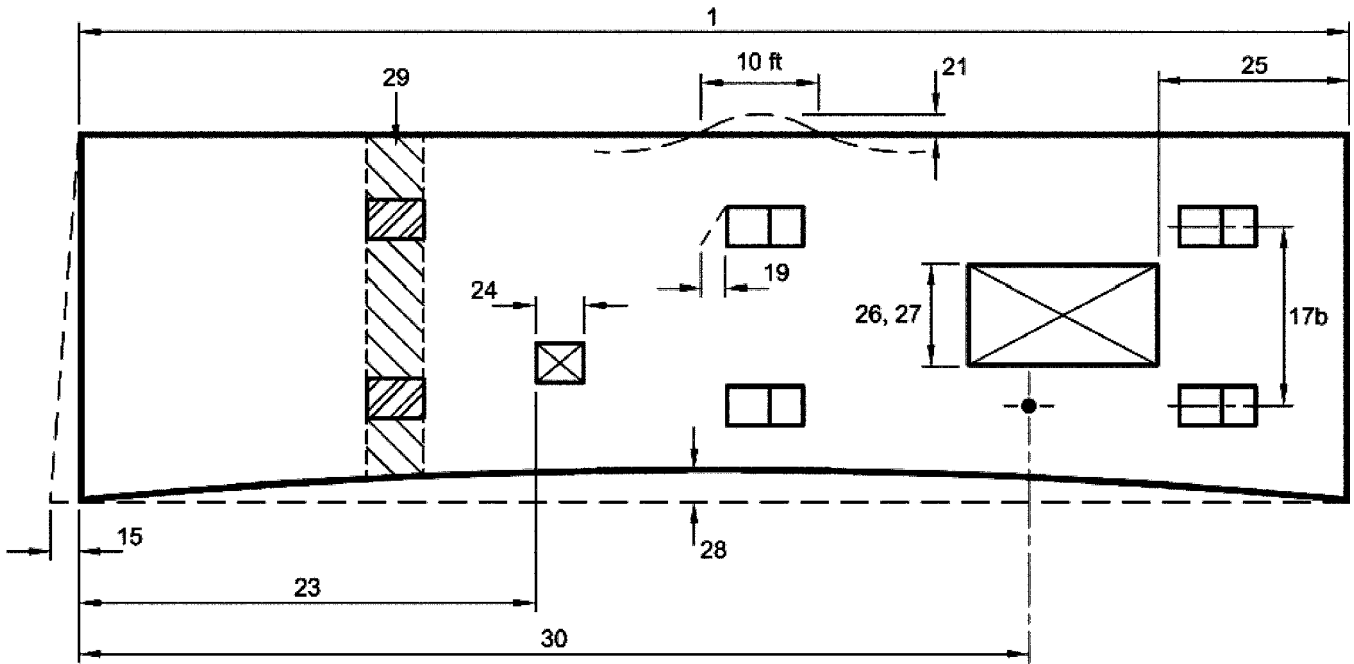


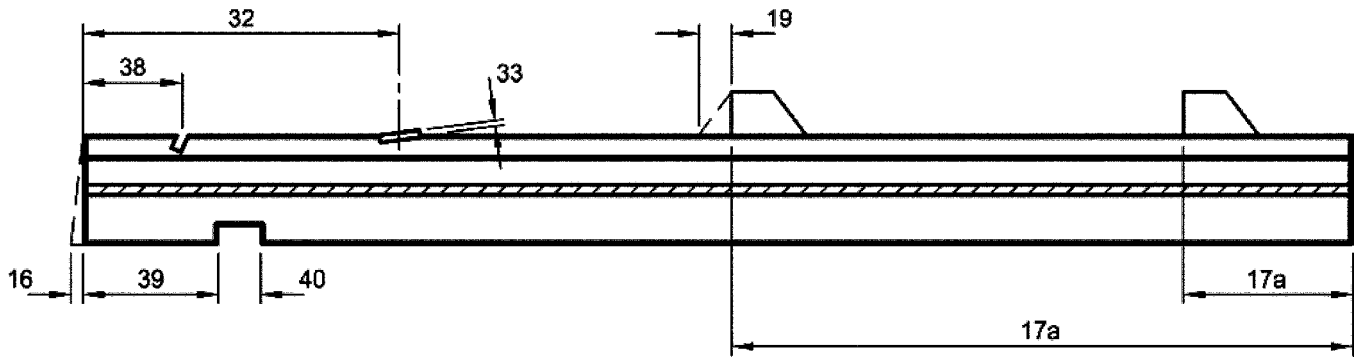
Fig. 2.7—Product deviation: ribbed wall panel.



Cross Section

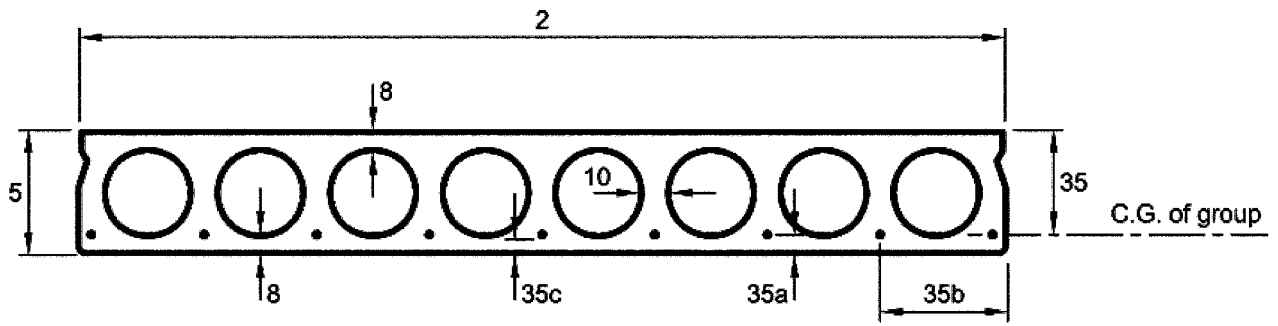


Plan

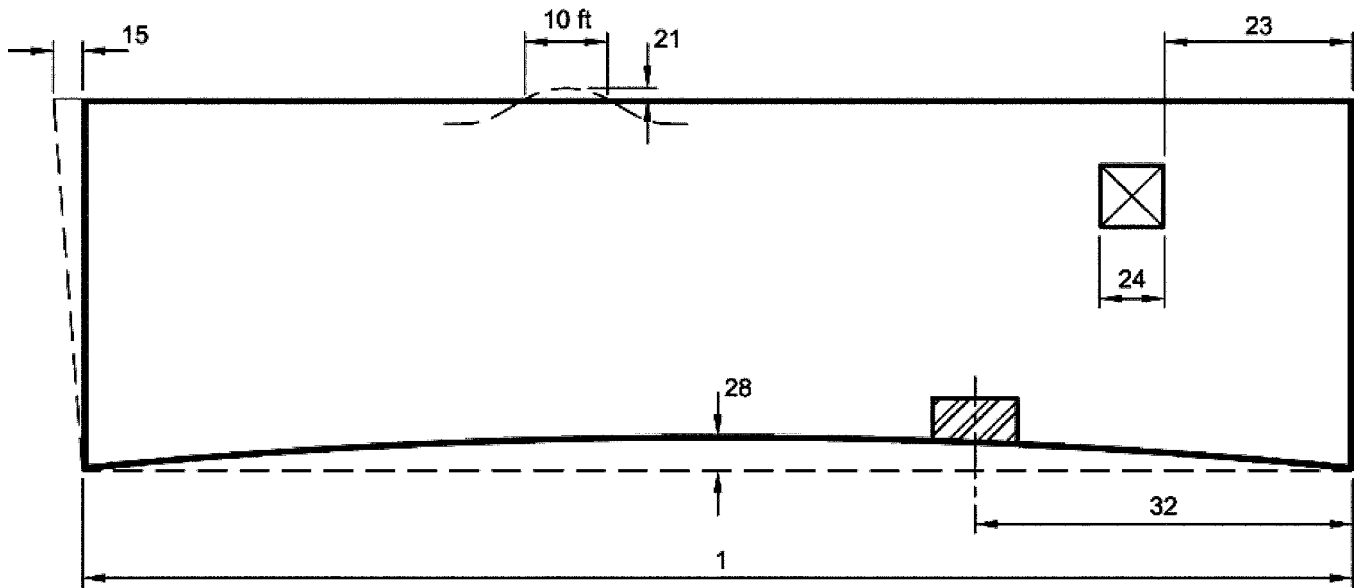


Elevation

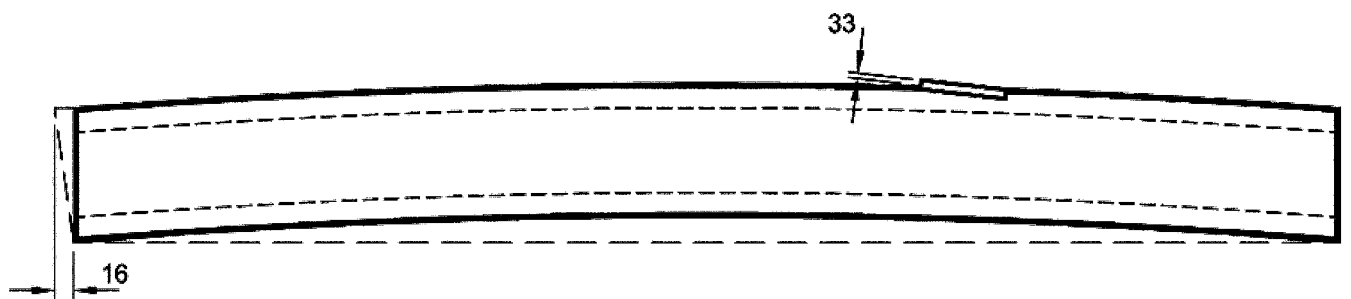
Fig. 2.8—Product deviation: flat wall panel.



*Cross Section*



*Plan*



*Elevation*

*Fig. 2.9—Product deviation: hollow core wall panel.*

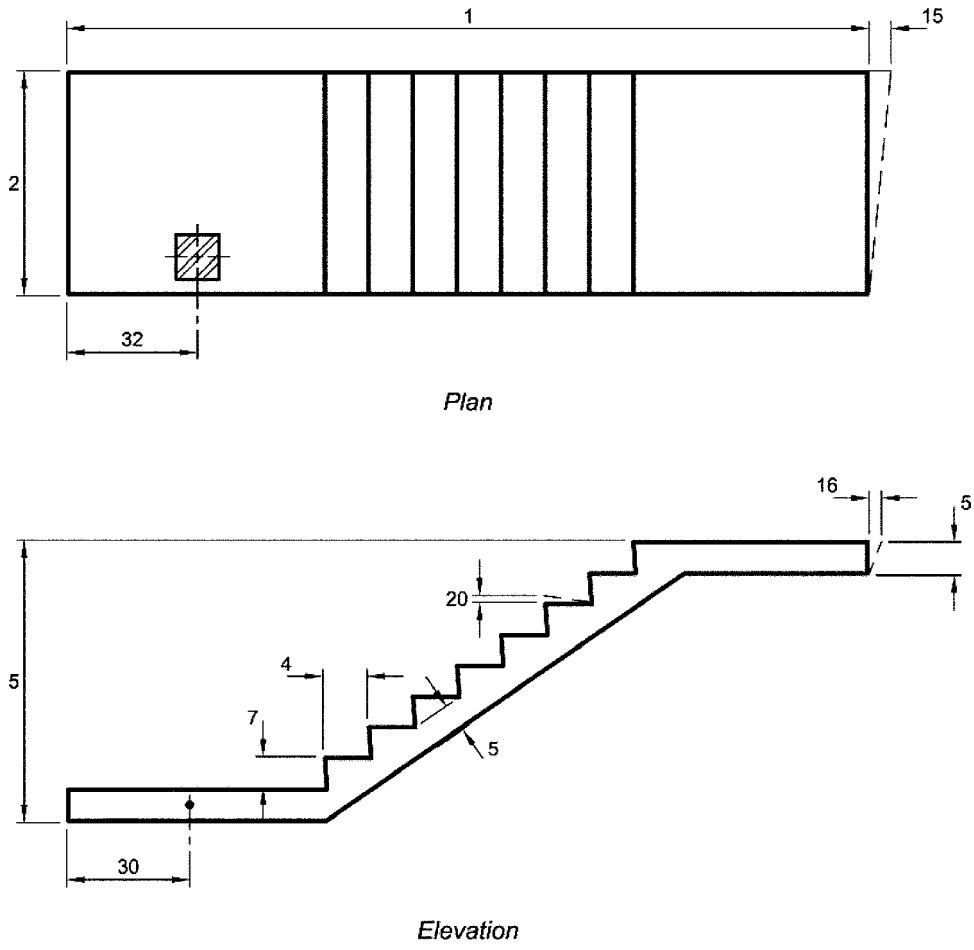


Fig. 2.10—Product deviation: step unit.

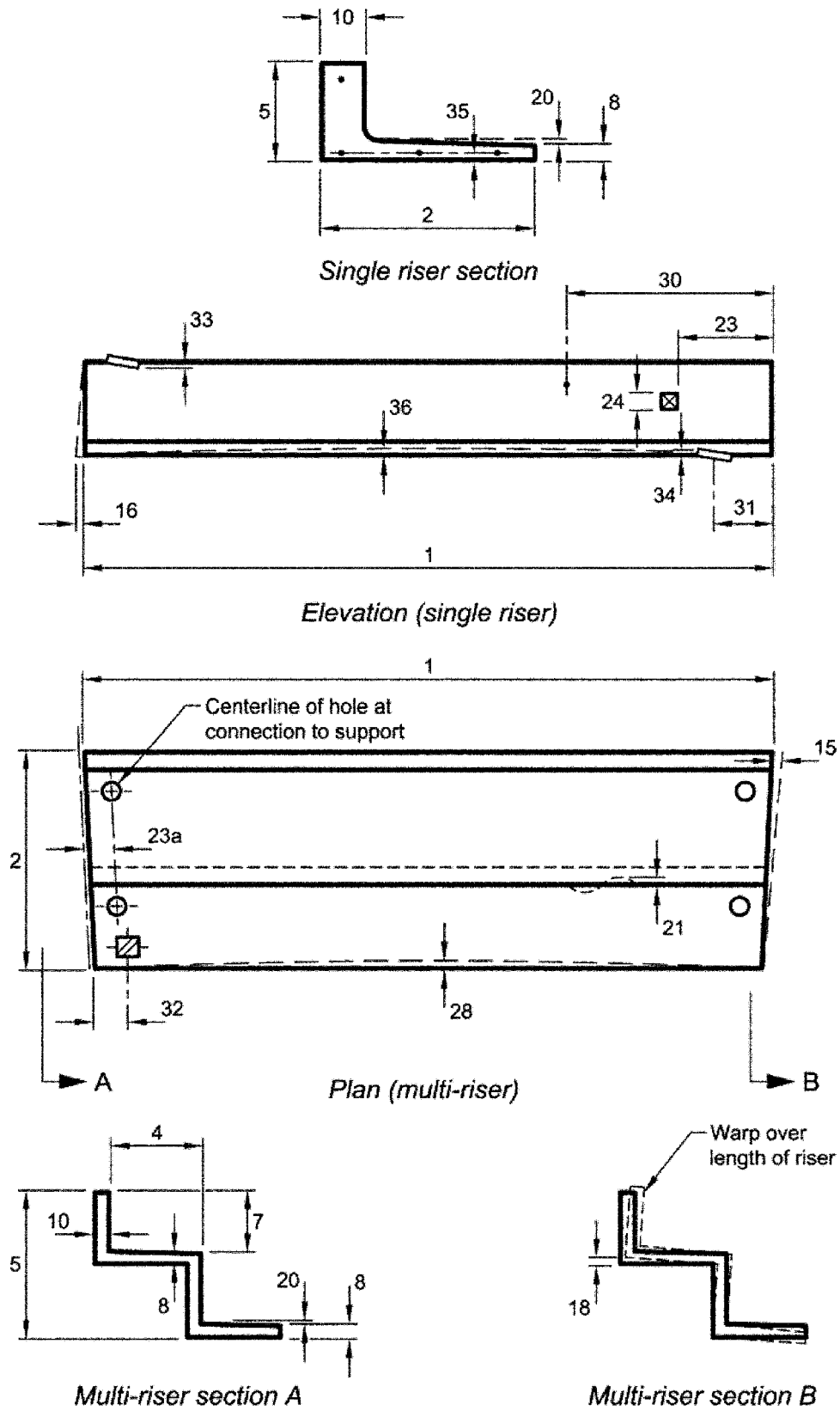


Fig. 2.11—Product deviation: stadium riser.

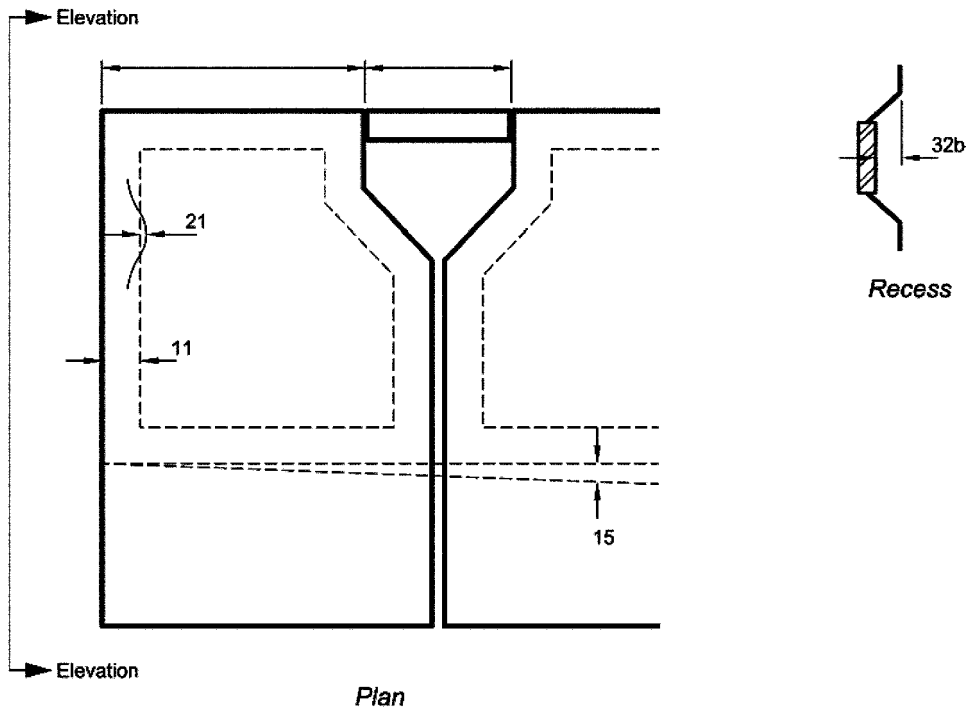
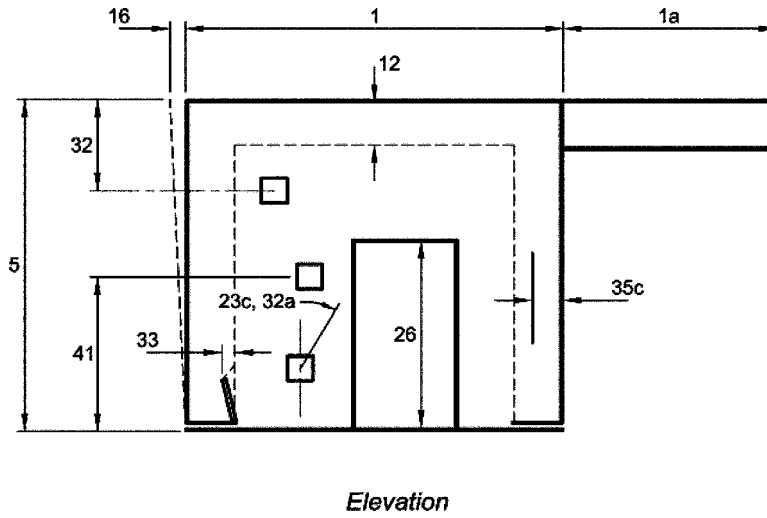
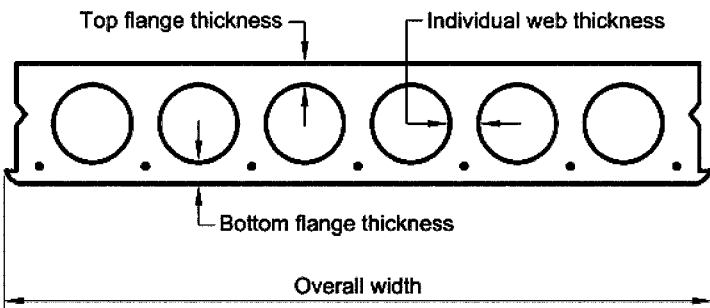


Fig. 2.12—Product deviation: room module.



Note:  
The flange thickness is the least distance between each core and the outer surface and the web thickness is the sum of the individual web thicknesses measured at least distance between adjacent cores and the least distances between the outermost core and the edge of the member.

Fig. 2.13—Hollow core flange area and web thickness calculations.

**SECTION 3—STRUCTURAL PRODUCT ERECTION TOLERANCES**

**3.1—Scope**

This section provides erection tolerances for precast structural products.

**3.2—Tolerances**

Unless otherwise specified, erection of structural products shall comply with the tolerances listed in Table 3.1. The filled circles in Table 3.1 indicate which tolerances are applicable to each product type. Each tolerance category is assigned a number in Table 3.1, and those numbers are used in Fig. 3.1 through 3.8 to illustrate the different categories of erection tolerances.

**Table 3.1—Erection tolerances for structural members**

Erection tolerance	Product type											
	Single tee (Fig. 3.1)	Double tee (Fig. 3.1)	HC slab (Fig. 3.2)	Joist (Fig. 3.1)	Beam and spandrel (Fig. 3.3)	Column (Fig. 3.4)	Ribbed wall panel (Fig. 3.5)	Flat wall panel (Fig. 3.5)	HC wall panel (Fig. 3.5)	Step unit (Fig. 3.6)	Stadium riser (Fig. 3.7)	Room module (Fig. 3.8)
<b>1. Deviation from specified horizontal dimension between controlling vertical surface or line and building reference line *</b>												
1/2 in.						•	•	•	•	•		•
1 in.	•	•	•	•	•						•	
<i>a. From theoretical centerline of support</i>												
±1 in.											•	
<b>2. Deviation from specified vertical dimension between controlling horizontal surface or line and building reference line †</b>												
<i>a. From top elevation</i>												
+1/4 in., -1/2 in.						•						
3/8 in.										•		•
<i>b. From horizontal surface</i>												
<i>Bearing surface ledge or haunch</i>												
+1/4 in., -1/2 in.					•	•	•	•	•			
<i>Pretopped</i>												
±1/4 in.	•	•								•		
±1/2 in.											•	
<i>Field-topped or untopped</i>												
±3/8 in.										•		
±3/4 in.	•	•	•									
<i>Carpet direct</i>												
±1/4 in.			•									
<b>3. Deviation from plumb of the controlling vertical surface or line</b>												
1/8 in. per ft of height					•							
1/2 in. (L-beam)					•							
3/4 in. (inverted T-beam)					•							
1/4 in. over member height												•
1/4 in. in any 10 ft of element height						•	•	•	•			
1 in. maximum for structures 100 ft or less in height						•	•	•	•			
2 in. maximum for structure over 100 ft in height (1/8 in. maximum per story)						•	•	•	•			
<b>4. Deviation from alignment of matching edges</b>												
1 in.	•	•	•	•						•		
<i>Exposed to view</i>												
1/4 in.												•
1/2 in.							•	•	•			
<i>Not exposed to view</i>												
1/2 in.					•							
<i>a. At horizontal surface</i>												
1/4 in., pretopped										•	•	
3/8 in., field-topped										•		





**Table 3.1—Erection tolerances for structural members (cont.)**

Erection tolerance	Product type											
	Single tee (Fig. 3.1)	Double tee (Fig. 3.1)	HC slab (Fig. 3.2)	Joist (Fig. 3.1)	Beam and spandrel (Fig. 3.3)	Column (Fig. 3.4)	Ribbed wall panel (Fig. 3.5)	Flat wall panel (Fig. 3.5)	HC wall panel (Fig. 3.5)	Step unit (Fig. 3.6)	Stadium riser (Fig. 3.7)	Room module (Fig. 3.8)
<b>11. Deviation in bowing between adjacent members of the same design</b>												
1/2 in.							•	•	•			
<b>12. Deviation in camber or sweep measured at midspan between adjacent members of the same design</b>												
±3/16 in. per 10 ft of member length											•	

\*For precast members erected on steel supports, the centerline of the steel support shall take precedence over the building reference line.

†For horizontal spanning members, the controlling horizontal surface shall be taken at the ends.

§Bearing pads adjacent to the unarmored edge of a support member shall be set back at least 1/2 in. from the closest edge.

‡8b controls over 8a when both tolerances apply.

#Joint width of at least 1/4 in. is required. See Fig. 3.7 for horizontal joint width location.

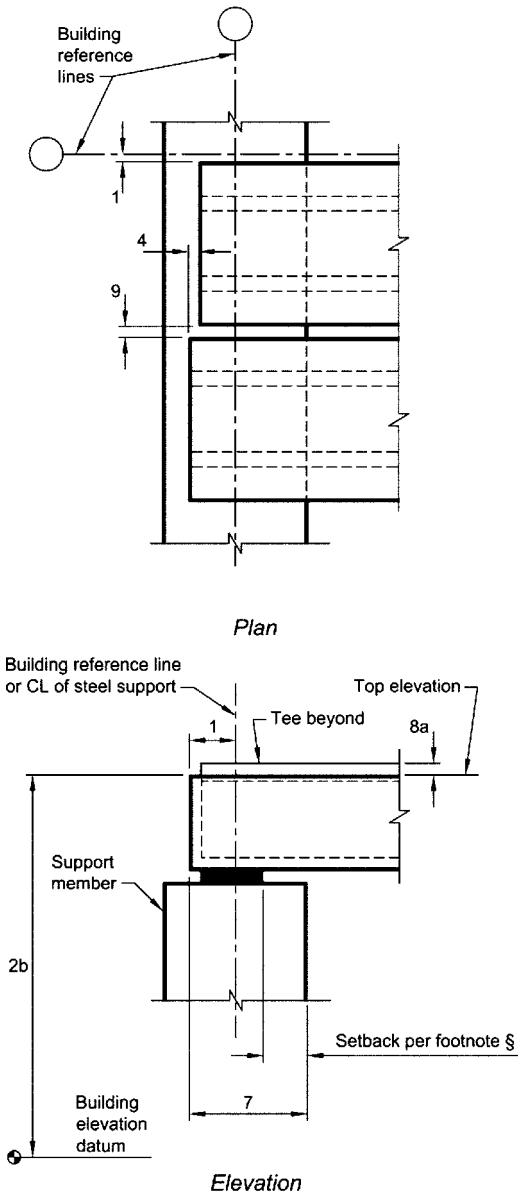


Fig. 3.1—Erection deviation: tees or joists.

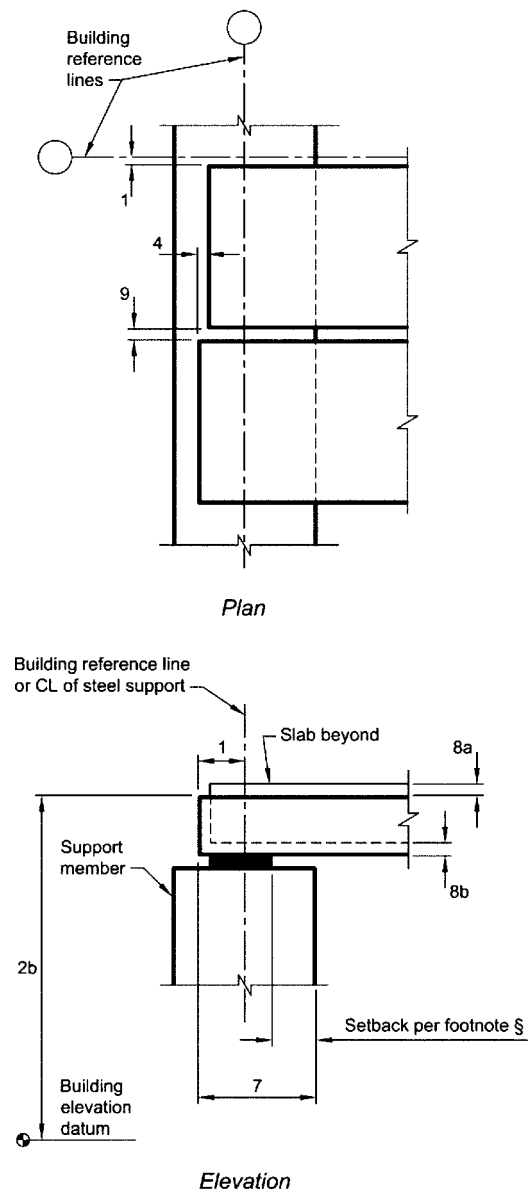


Fig. 3.2—Erection deviation: hollow core slab.

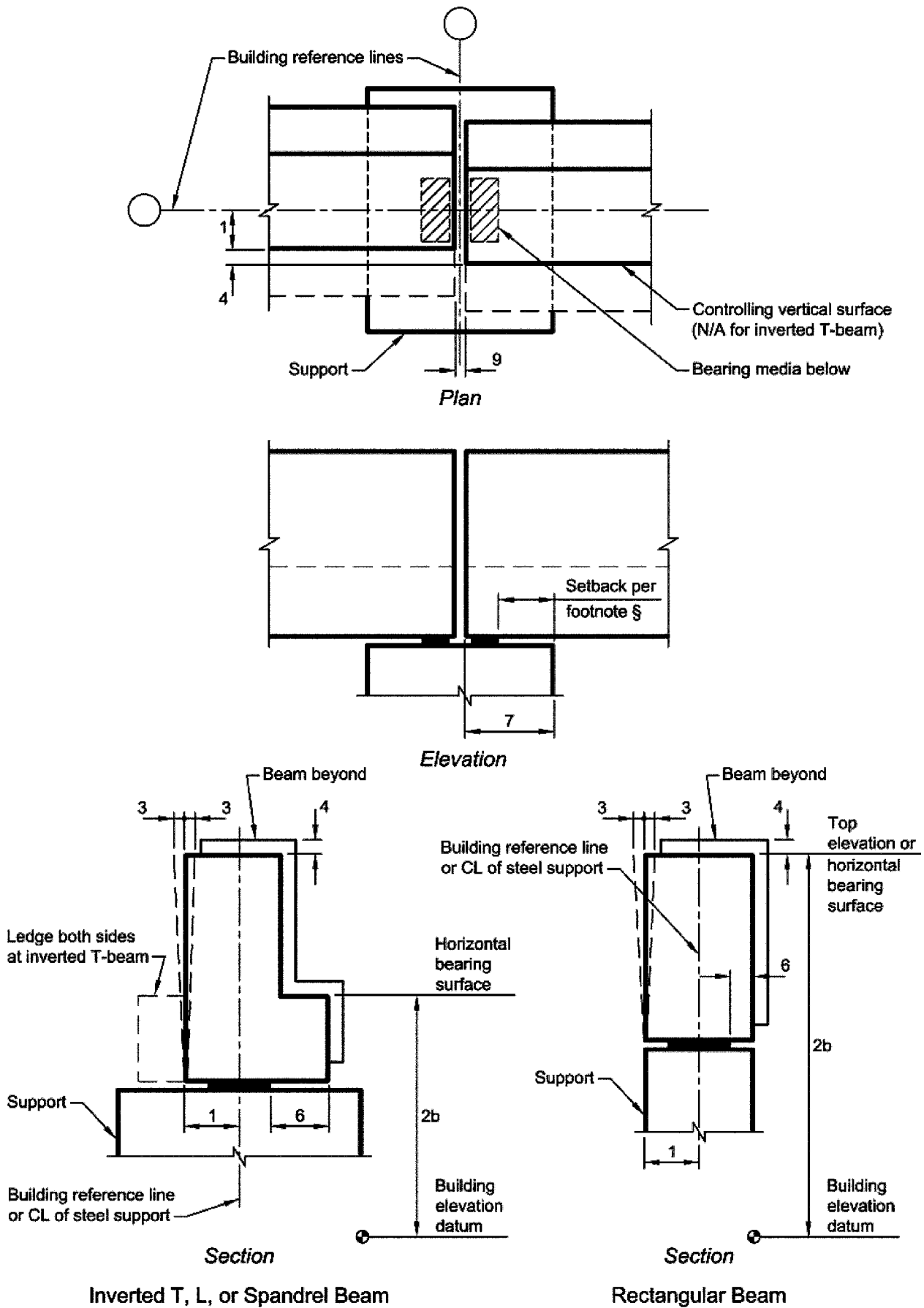


Fig. 3.3—Erection deviation: beam and spandrel.

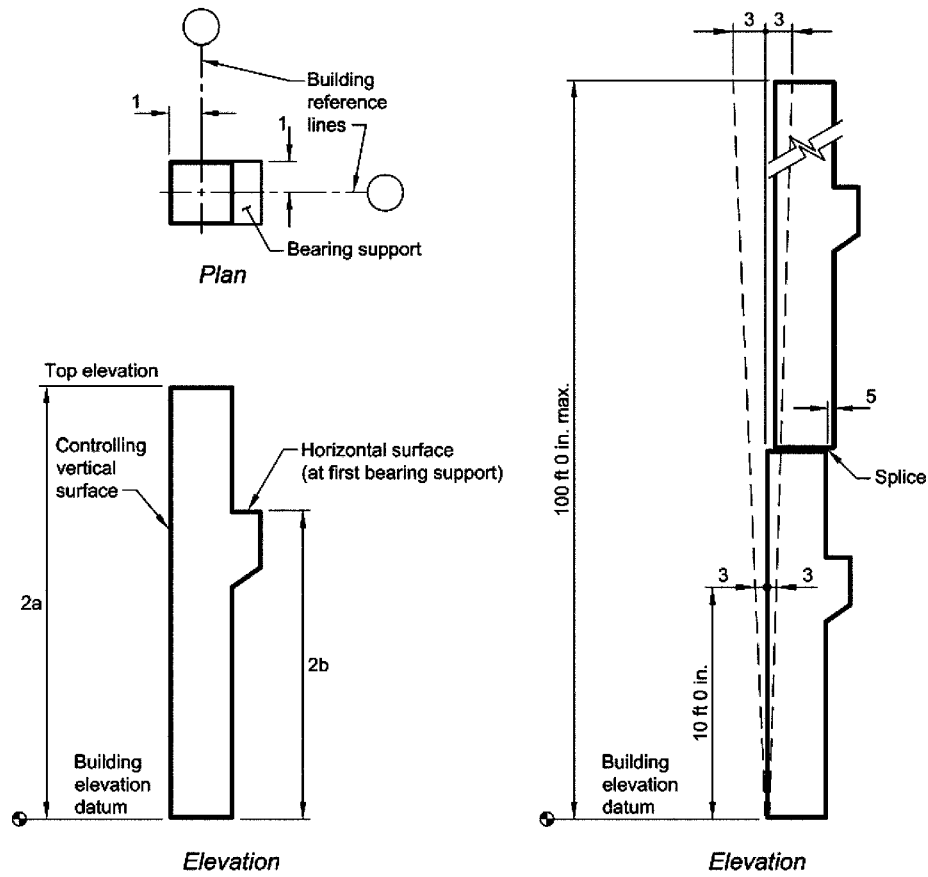


Fig. 3.4—Erection deviation: column.

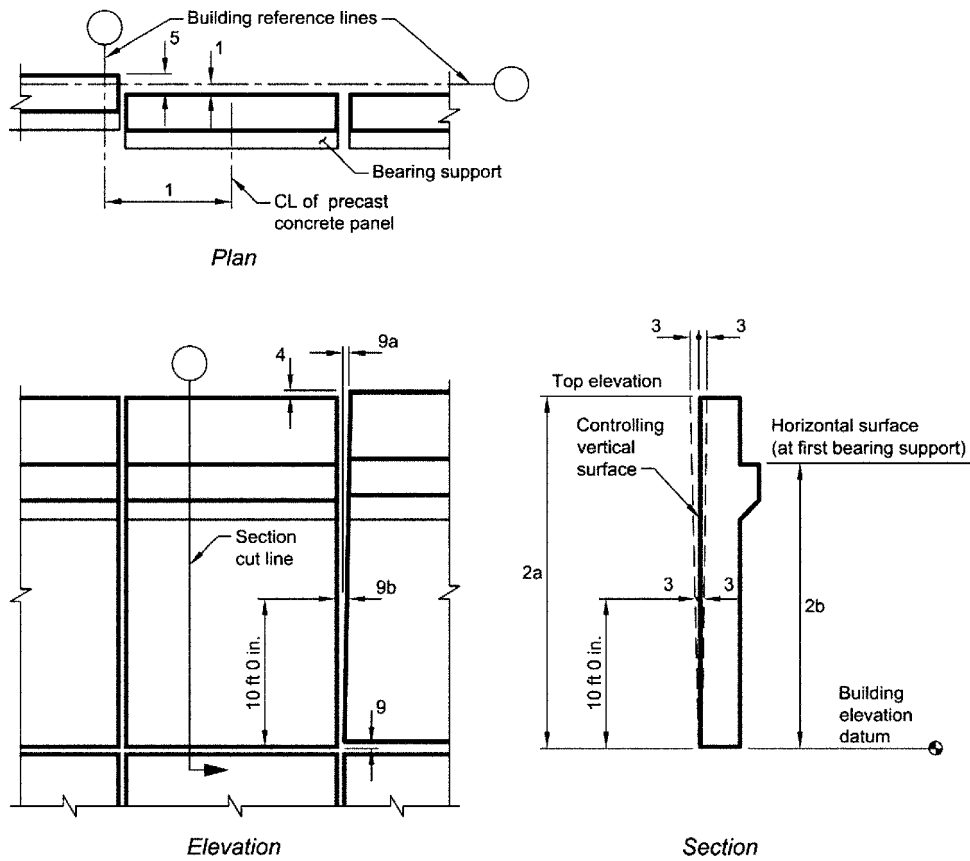


Fig. 3.5—Erection deviation: wall panels.

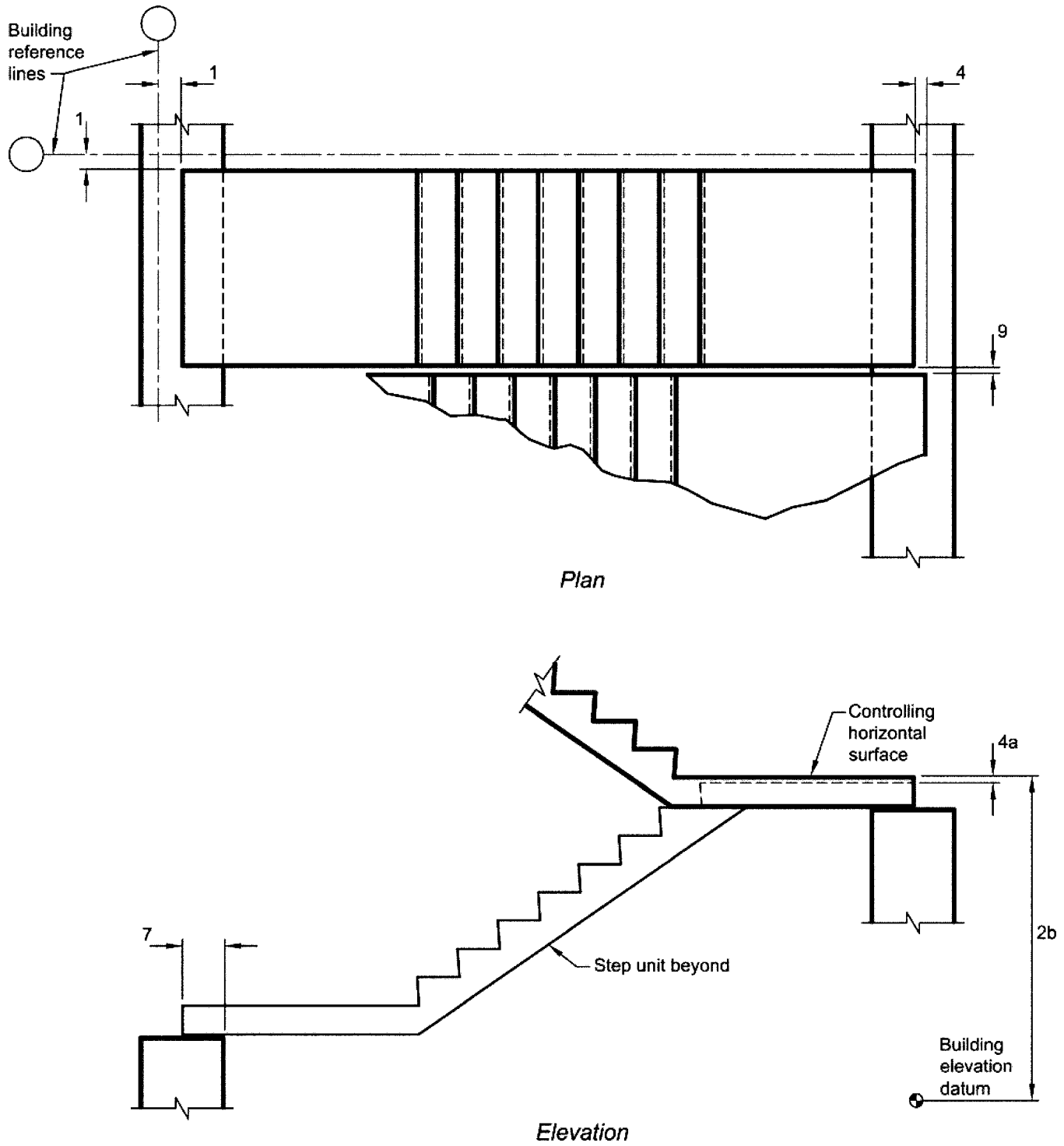


Fig. 3.6—Erection deviation: step unit.

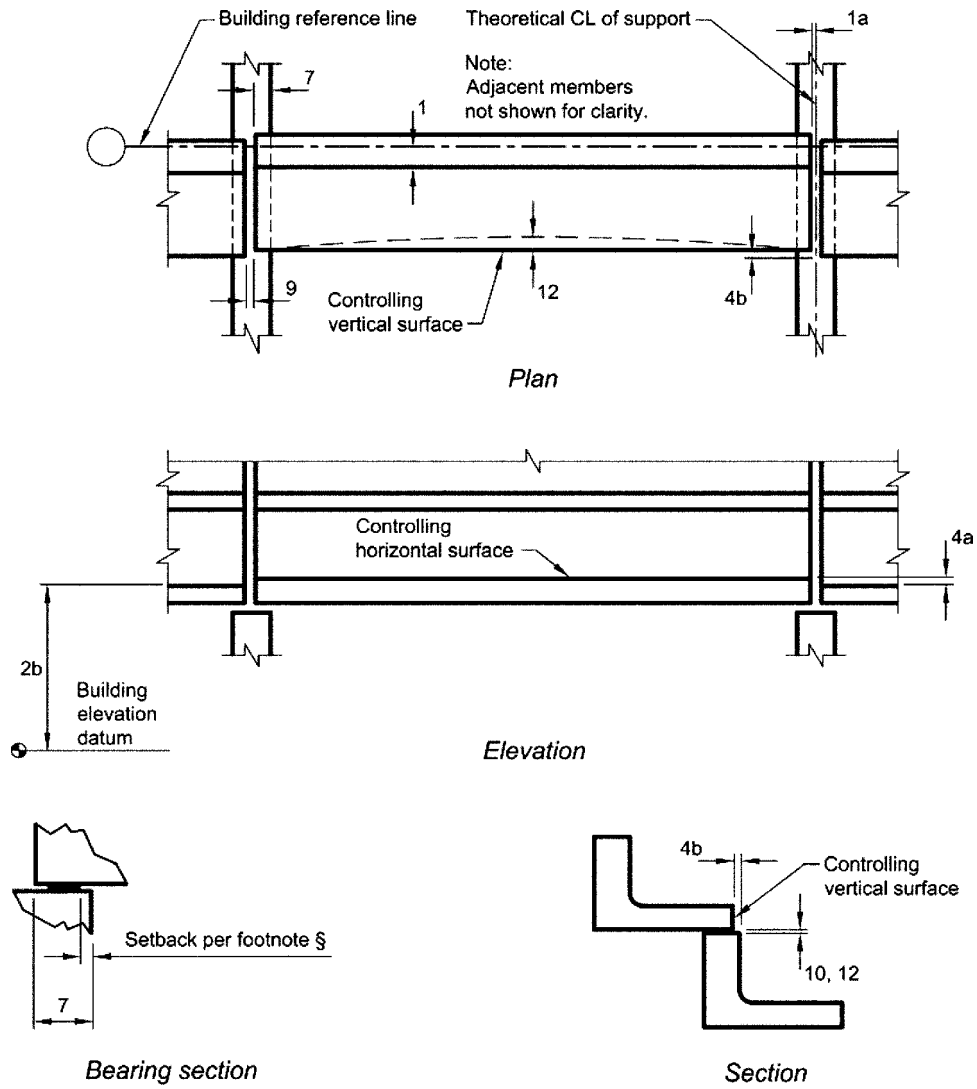


Fig. 3.7—Erection deviation: stadium riser.

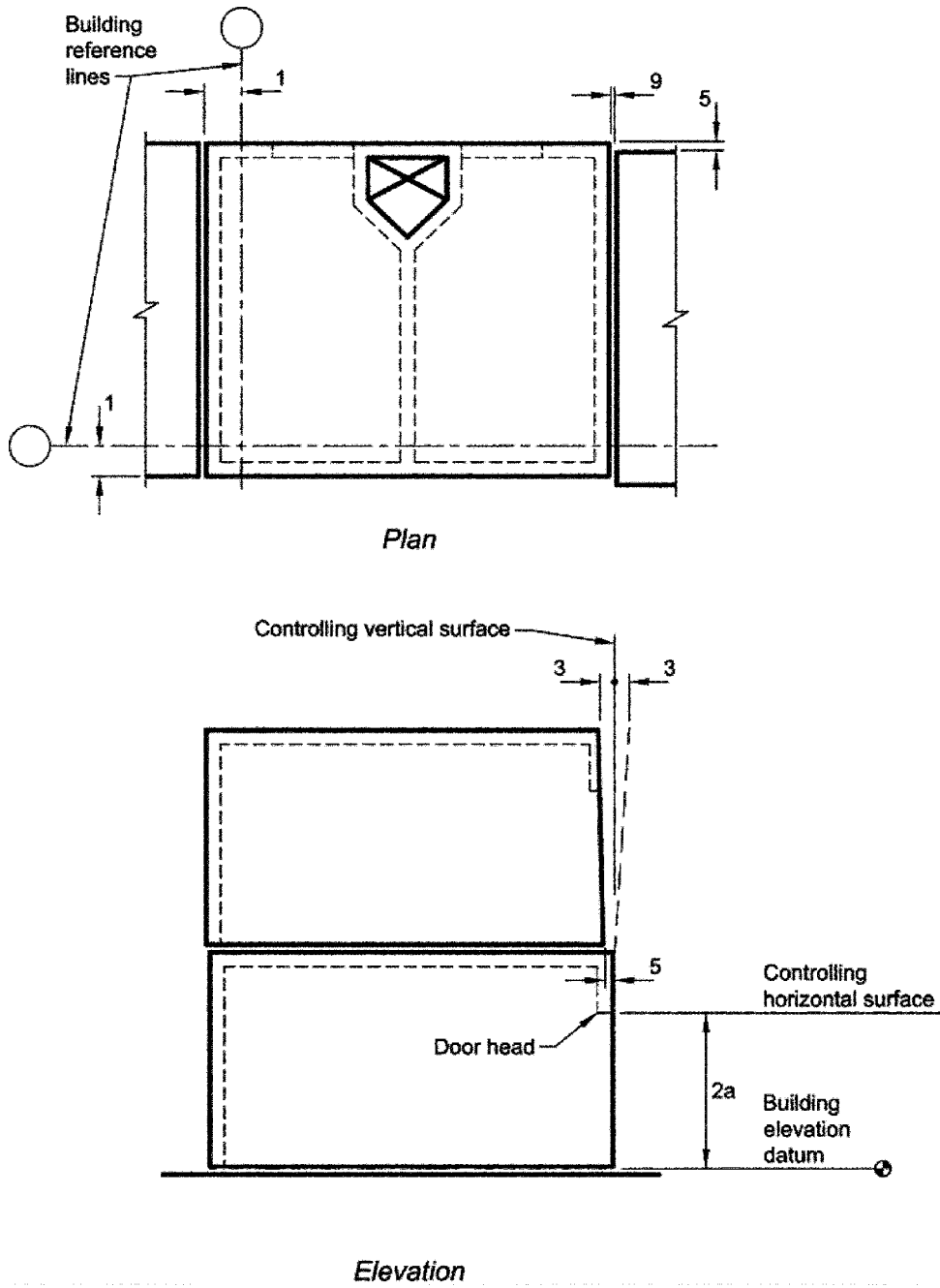


Fig. 3.8—Erection deviation: room module.

**SECTION 4—NONSTRUCTURAL ARCHITECTURAL PRODUCT TOLERANCES**

**4.1—Scope**

This section provides tolerances for precast nonstructural architectural products specified in the Contract Documents.

**4.2—Tolerances**

Unless otherwise specified, nonstructural architectural products shall comply with tolerances listed in Table 4.1. The filled circles in Table 4.1 indicate which tolerances are applicable to each product type. Each tolerance category is assigned a number in Table 4.1, and those numbers are used in Fig. 4.1 through 4.4 to illustrate the different categories of tolerances.

**Table 4.1—Product tolerances for nonstructural architectural members**

Product tolerance	Product type			
	Architectural panels and spandrels (Fig. 4.1)	Brick-faced members* (Fig. 4.2)	Sills, lintels, copings, quoins, and medallions (Fig. 4.3)	Bollards, benches, and planters (Fig. 4.4)
<b>1. Deviation from specified length</b>				
±1/8 in.			•	
±1/4 in.				•
<i>Where one face will be installed in dead wall space of a mortar joint</i>				
±1/4 in.			•	
<b>2. Deviation from specified width or diameter</b>				
±1/4 in.				•
<b>3. Deviation from specified overall width at the face exposed to view</b>				
±1/8 in.			•	
<i>Up to 10 ft</i>				
±1/8 in.	•			
<i>10 to 20 ft</i>				
1/8 in., -3/16 in.	•			
<i>20 to 40 ft</i>				
±1/4 in.	•			
<i>Greater than 40 ft</i>				
±1/16 in. per 10 ft	•			
<b>4. Deviation from specified overall width at the face not exposed to view</b>				
<i>Up to 10 ft</i>				
±1/4 in.	•			
<i>10 to 20 ft</i>				
+1/4 in., -3/8 in.	•			
<i>20 to 40 ft</i>				
±3/8 in.	•			
<i>Greater than 40 ft</i>				
±1/8 in. per 10 ft	•			
<b>5. Deviation from specified overall height at the face exposed to view</b>				
±1/8 in.			•	
<i>Up to 10 ft</i>				
±1/8 in.	•			
<i>10 to 20 ft</i>				
+1/8 in., -3/16 in.	•			
<i>20 to 40 ft</i>				
±1/4 in.	•			
<i>Greater than 40 ft</i>				
±1/16 in. per 10 ft	•			
<i>Up to 10 ft</i>				
±1/4 in.	•			

**Table 4.1—Product tolerances for nonstructural architectural members (cont.)**

Product tolerance	Product type			
	Architectural panels and spandrels (Fig. 4.1)	Brick-faced members* (Fig. 4.2)	Sills, lintels, coping, quoins, and medallions (Fig. 4.3)	Bollards, benches, and planters (Fig. 4.4)
<b>6. Deviation from specified overall height at the face not exposed to view</b>				
<i>Up to 10 ft</i>	±1/4 in.	•		
<i>10 to 20 ft</i>	+1/4 in., -3/8 in.	•		
<i>20 to 40 ft</i>	±3/8 in.	•		
<i>Greater than 40 ft</i>	±1/8 in. per 10 ft	•		
<b>7. Deviation from specified height</b>				
	±1/4 in.			•
<b>8. Deviation from specified width of rib</b>				
	±1/8 in.	•		
<b>9. Deviation from specified flange thickness</b>				
	±1/8 in.		•	
	+1/4 in., -1/8 in.	•		
<b>10. Deviation from specified total thickness</b>				
	±1/8 in.		•	
<i>Where one face will be installed in dead wall space of a mortar joint</i>				
	±1/4 in.		•	
	+1/4 in., -1/8 in.	•		
<b>11. Deviation from specified distance between ribs</b>				
	±1/8 in.	•		
<b>12. Deviation from specified distance between rib and edge of flange</b>				
	±1/8 in.	•		
<b>13. Deviation from specified diagonal dimension (squareness or skew) of the panel, a rough opening, or a finished opening</b>				
	±1/8 in. per 6 ft, ±1/2 in. maximum	•		
<b>14. Deviation from specified location of a haunch, corbel, or ledge bearing surface (from end of member)</b>				
	±1/4 in.	•		
<b>15. Deviation from specified dimensions of a haunch, corbel, or ledge bearing surface</b>				
	±1/4 in.	•		
<b>16. Deviation from specified relative position of adjacent bearing surfaces</b>				
	±1/4 in.	•		
<b>17. Deviation from specified location of rustications and architectural features</b>				
	±1/16 in.		•	
	±1/8 in.	•		
	±1/4 in.			•
<b>18. Deviation from specified dimensions of rustications and architectural features</b>				
	±1/16 in.		•	
	±1/8 in.	•		
	±1/4 in.			•
<b>19. Deviation from plane (warping)</b>				
	1/16 in. per ft	•	•	
<b>20. Deviation of a local exposed surface from reference plane (roughness), as shown in Fig. 1.4</b>				
	1/8 in. per 5 ft		•	
<i>At exposed surfaces</i>				
	1/4 in. per 10 ft	•		



**Table 4.1—Product tolerances for nonstructural architectural members (cont.)**

Product tolerance	Product type			
	Architectural panels and spandrels (Fig. 4.1)	Brick-faced members* (Fig. 4.2)	Sills, lintels, coping, quoins, and medallions (Fig. 4.3)	Bollards, benches, and planters (Fig. 4.4)
<b>21. Deviation from plane (bowing)</b>				
length/360, 1/4 in. maximum			•	
length/360, 1 in. maximum	•			
<b>22. Deviation from specified location of a blockout hidden from view and used for penetrations of other trades</b>				
±3/4 in.	•			
<b>23. Deviation from specified size of a blockout hidden from view and used for penetrations of other trades</b>				
±3/4 in.	•			
<b>24. Deviation from specified location of a rough opening or finished opening</b>				
±3/4 in.	•			
<b>25. Deviation from specified dimension of an exposed blockout, rough opening, or finished opening within one unit (any direction)</b>				
±3/4 in.	•			
<b>26. Deviation from specified location of an insert or accessory</b>				
<i>On formed surfaces</i>				
±1/8 in.			•	
±1/4 in.				•
<i>On unformed surfaces</i>				
±1/4 in.				•
±3/8 in.			•	
±1/2 in.	•			
<b>27. Deviation from specified location of a sleeve</b>				
±1/2 in.	•			
<b>28. Deviation from specified location of an embedment</b>				
±1 in.	•			
<b>29. Deviation from specified location of a flashing reglet</b>				
±1/4 in.	•			
<i>At panel edge</i>				
±1/8 in.	•			
<b>30. Deviation from specified size of reglets for glazing gaskets</b>				
±1/8 in.	•			
<b>31. Deviation from specified location of an electrical box, hose bib, or any accessory of another trade</b>				
±1/2 in.	•			
<b>32. Deviation from plane of a bearing plate (tipping and flushness)</b>				
±1/8 in.	•			
<b>33. Deviation from plane of an embedment (tipping and flushness)</b>				
±1/4 in.	•			
<b>34. Deviation from specified orientation of an embedment (rotation)</b>				
2 degrees	•			
<b>35. Deviation from specified position of reinforcement steel (bars or welded wire reinforcement)</b>				
<i>Where reinforcement is structural</i>				
±1/4 in.	•			
<i>Where position decreases concrete cover</i>				
1/4 in.	•			
<i>All other cases</i>				
±1/2 in.	•			

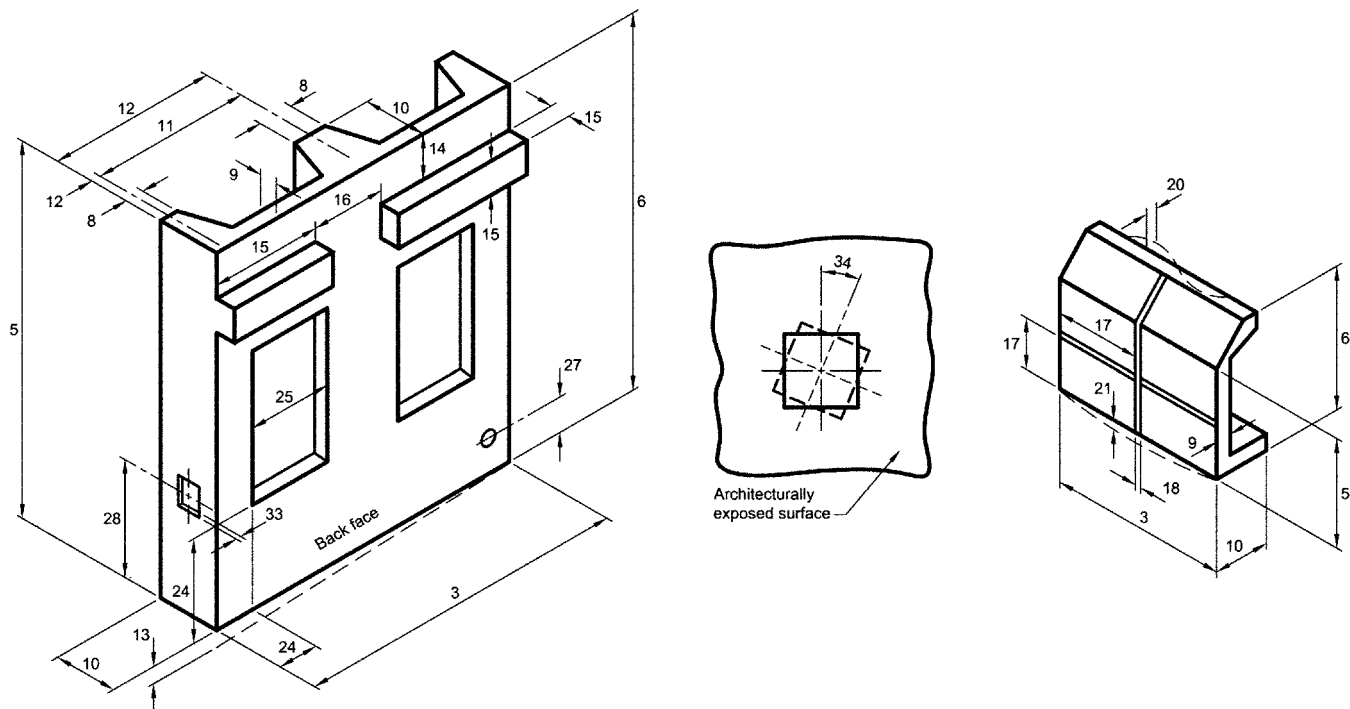
**Table 4.1—Product tolerances for nonstructural architectural members (cont.)**

Product tolerance	Product type			
	Architectural panels and spandrels (Fig. 4.1)	Brick-faced members* (Fig. 4.2)	Sills, lintels, coping, quoins, and medallions (Fig. 4.3)	Bollards, benches, and planters (Fig. 4.4)
<b>36. Deviation from specified position of strand</b>				
<i>Perpendicular to panel</i>				
±1/4 in.	•			
<i>Parallel to panel</i>				
±1 in.	•			
<b>37. Deviation from alignment of mortar joints in one member</b>				
<i>Offset from joints above and below</i>				
1/8 in.		•		
<i>Offset from member centerline (relative to typical joint location)</i>				
±1/8 in.		•		
<b>38. Deviation from specified width of exposed mortar joint</b>				
±1/8 in.		•		
<b>39. Deviation from plane of exposed brick surface, over length or width of a brick, to face of individual brick (tipping)†</b>				
-1/4 in., but not more than joint depth of form liner		•		
<b>40. Deviation from specified width of exposed return surface perpendicular to the primary exposed brick surface</b>				
+1/4 in., -1/8 in.		•		
<b>41. Deviation from plane of exposed brick surface to face of individual brick‡</b>				
-1/4 in., but not more than joint depth of form liner		•		

\*Only brick-related tolerances are indicated in this column. All other product tolerances for the member to which the brick facing is attached are specified under that product type.

†Number of tipped bricks in one member is limited to a maximum of 2% of the total bricks on the member.

‡Number of out-of-plane bricks in one member is limited to a maximum of 2% of the total bricks on the member.



*Fig. 4.1—Product deviation: architectural panels and spandrels.*

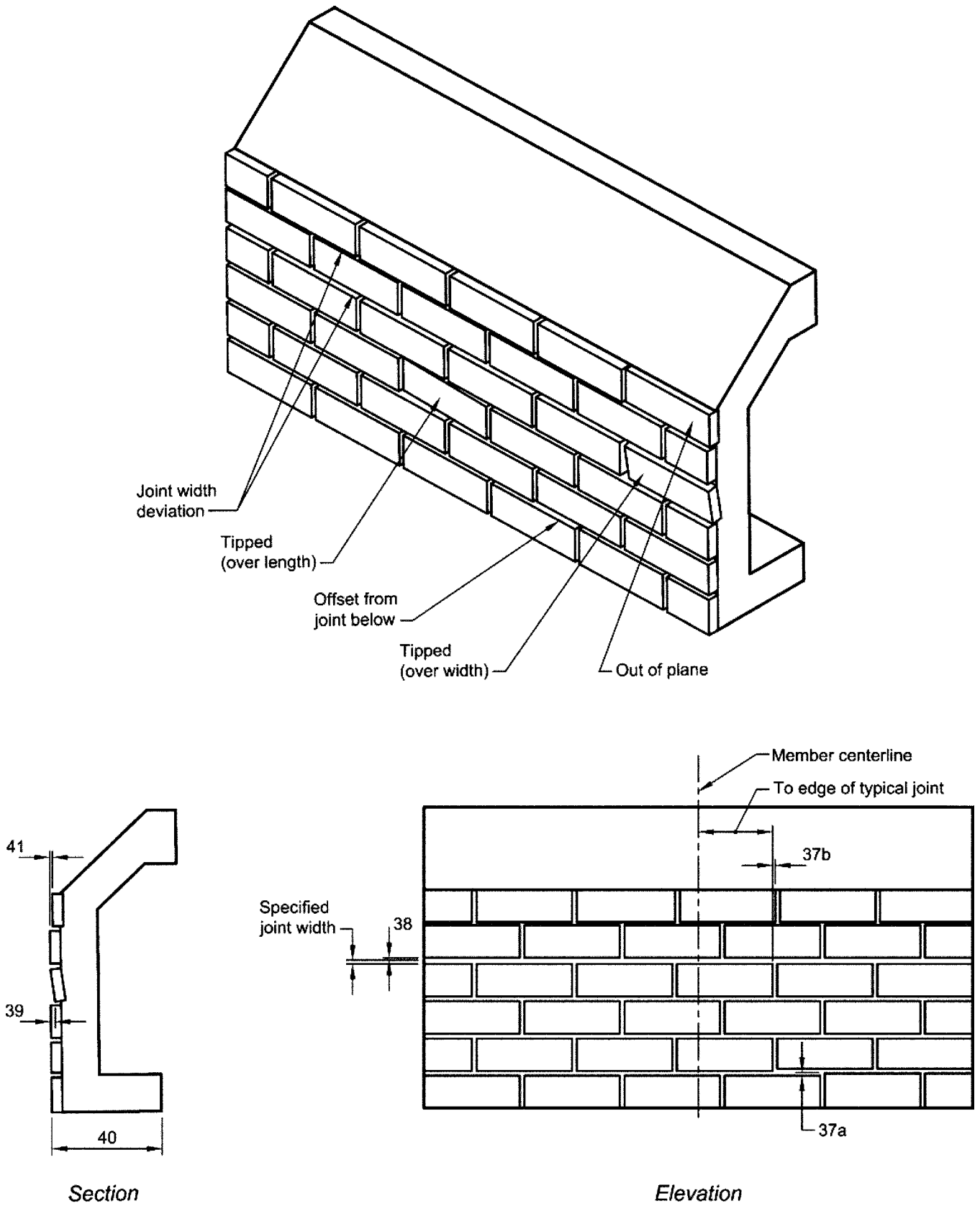


Fig. 4.2—Product deviation: brick-faced members.

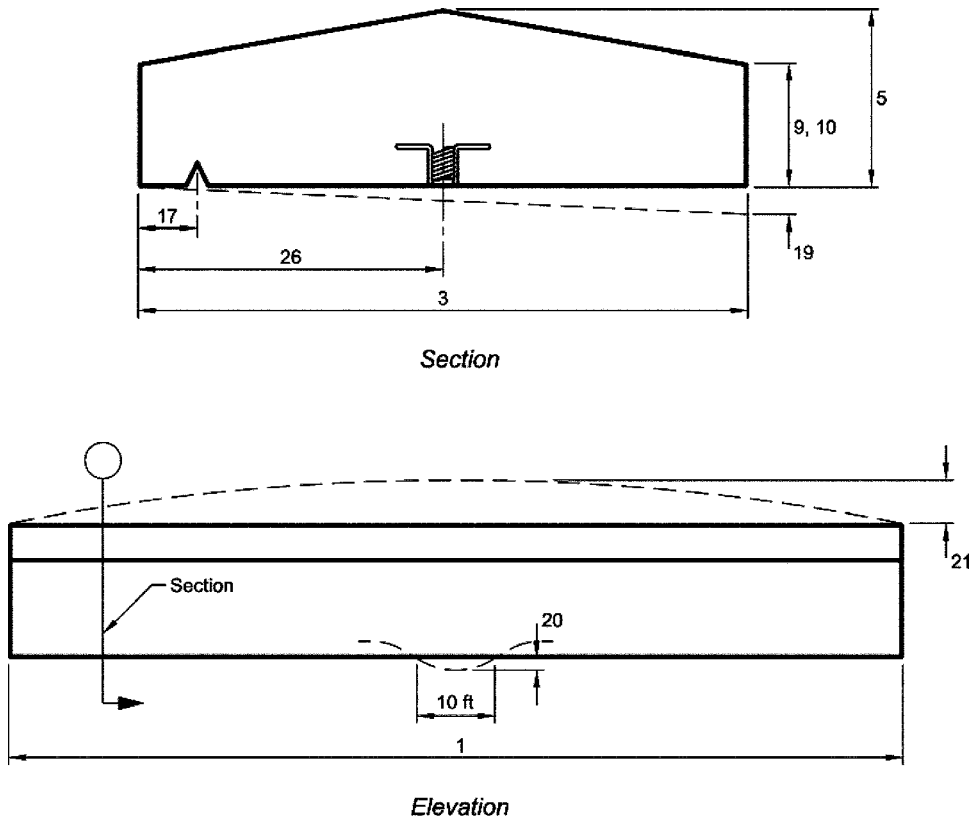


Fig. 4.3—Product deviation: sills, lintels, copings, quoins, and medallions.

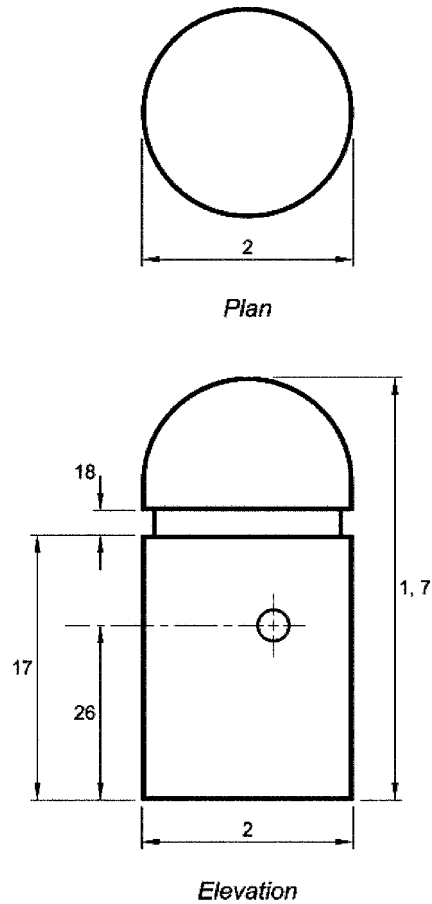


Fig. 4.4—Product deviation: bollards, benches, and planters.

**SECTION 5—NONSTRUCTURAL ARCHITECTURAL PRODUCT ERECTION TOLERANCES**

**5.1—Scope**

This section provides erection tolerances for precast nonstructural architectural products.

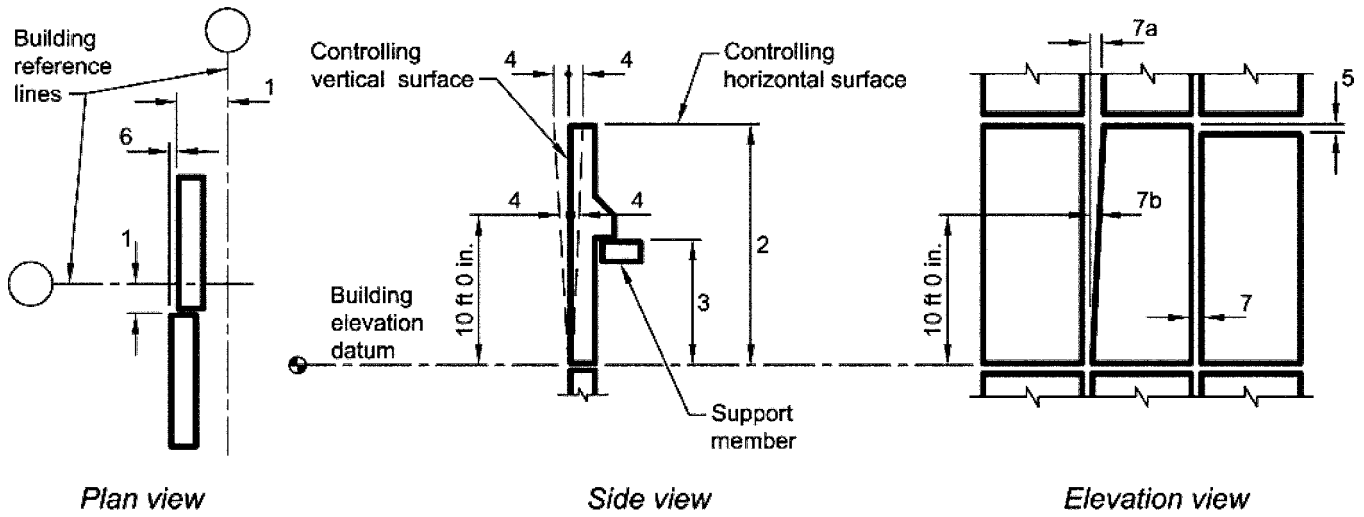
**5.2—Tolerances**

Unless otherwise specified, erection of nonstructural architectural products shall comply with the tolerances listed in Table 5.1. The filled circles in Table 5.1 indicate which tolerances are applicable to each product type. Each tolerance category is assigned a number in Table 5.1, and those numbers are used in Fig. 5.1 to illustrate the different categories of erection tolerances.

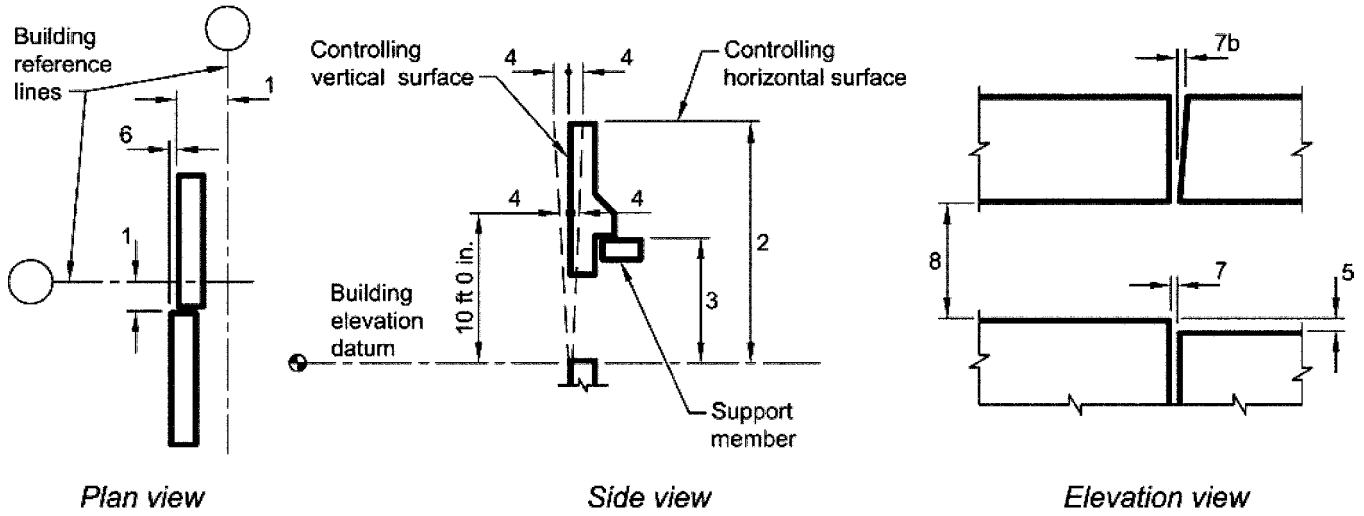
**Table 5.1—Erection tolerances for nonstructural architectural members**

Erection tolerance	Architectural panels and spandrels (Fig. 5.1)
<b>1. Deviation from specified horizontal dimension between controlling vertical surface or line and building reference line*</b>	
1/2 in.	•
<b>2. Deviation from specified vertical dimension between controlling horizontal surface or line and building reference line</b>	
<i>Where top of panel is exposed</i>	
$\pm 1/4$ in.	•
<i>Where top of panel is not exposed</i>	
$\pm 1/2$ in.	•
<b>3. Deviation from specified support elevation</b>	
<i>Higher than specified elevation</i>	
1/4 in.	•
<i>Lower than specified elevation</i>	
1/2 in.	•
<b>4. Deviation from plumb</b>	
1/4 in. in any 10 ft of member height	•
1 in. maximum over height of structure (or 100 ft, whichever is less)	•
2 in. maximum for structure over 100 ft (1/8 in. maximum per story)	•
<b>5. Deviation from alignment of matching edges</b>	
<i>Exposed relative to adjacent panel</i>	
1/4 in.	•
<i>Not exposed relative to adjacent panel</i>	
1/2 in.	•
<b>6. Deviation from alignment of matching faces</b>	
1/4 in.	•
<b>7. Deviation from specified joint width</b>	
$\pm 1/4$ in. (governs over joint taper)	•
<i>a. Joint taper over joint length</i>	
3/8 in.	•
<i>b. Joint taper over 10 ft or less in length</i>	
1/4 in.	•
<b>8. Deviation in height of opening between spandrels</b>	
$\pm 1/4$ in.	•
<b>9. Deviation in camber or bowing between adjacent members of the same design</b>	
1/4 in.	•

\*For precast members erected on steel supports, the centerline of the steel support shall take precedence over the building grid.



**Panels**



**Spandrels**

Fig. 5.1—Architectural panels and spandrels.

(nonmandatory portion follows)

**NOTES TO SPECIFIER**

**General notes**

**G1.** ACI Specification ITG-7-09 is intended to be used by reference or incorporation in its entirety in the Project Specification. Do not copy individual Parts, Sections, Articles, or Paragraphs into the Project Specification because taking them out of context may change their meaning.

**G2.** If Sections or Parts of ACI Specification ITG-7-09 are copied into the Project Specification or any other document, do not refer to them as an ACI specification, because the specification has been altered.

**G3.** A statement such as the following will serve to make ACI Specification ITG-7-09 a part of the Project Specification: “Work on (Project Title) shall conform to all requirements of ACI ITG-7-09 published by the American Concrete Institute, Farmington Hills, Michigan, except as modified by these Contract Documents.”

**G4.** Each technical Section of ACI Specification ITG-7-09 is written in the three-part Section format of the Construction Specifications Institute, as adapted for ACI requirements. The language is imperative and terse.

**G5.** ACI Specification ITG-7-09 is written to the Contractor. When a provision of this Specification requires action by the Contractor, the verb “shall” is used. If the Contractor is allowed to exercise an option when limited alternatives are available, the phrasing “either...or...” is used. Statements provided in the specification as information to the Contractor use the verbs “may” or “will.” Informational statements typically identify activities or options that “will” be taken or “may” be taken by the Owner or Architect/Engineer.

**FOREWORD TO CHECKLISTS**

**F1.** This Foreword is included for explanatory purposes only; it does not form a part of ACI Specification ITG-7-09.

**F2.** ACI Specification ITG-7-09 may be referenced by the Specifier in the Project Specification for any building project, together with supplementary requirements for the specific project. Responsibilities for project participants must be defined in the Project Specification. ACI Specification ITG-7-09 cannot and does not address responsibilities for any project participant other than the Contractor.

**F3.** Checklists do not form a part of ACI Specification ITG-7-09. Checklists assist the Specifier in selecting and specifying project requirements in the Project Specification.

**F4.** The Mandatory Requirements Checklist indicates work requirements regarding specific qualities, procedures, materials, and performance criteria that are not defined in ACI Specification ITG-7-09. The Specifier must include these requirements in the Project Specification.

**F5.** The Optional Requirements Checklist identifies Specifier choices and alternatives. The Checklist identifies the Sections, Parts, and Articles of the ACI Reference Specification ITG-7-09 and the action required or available to the Specifier. The Specifier should review each of the items in the Checklist and make adjustments to the needs of a particular project by including those selected alternatives as mandatory requirements in the Project Specification.

**F6. Recommended References**—Documents and publications that are referenced in the Checklists of ACI Specification ITG-7-09 are listed below. These references provide guidance to the Specifier and are not considered to be part of ACI Specification ITG-7-09.

*Precast/Prestressed Concrete Institute*

MNL-116-99	Manual for Quality Control for Plants and Production of Structural Precast Concrete Products
MNL-117-96	Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products
MNL-127-99	Erectors Manual—Standards and Guidelines for the Erection of Precast Concrete Products
MNL-135-00	Tolerance Manual for Precast and Prestressed Concrete Construction

The above publications may be obtained from the following organization:

Precast/Prestressed Concrete Institute (PCI)  
 209 W. Jackson Blvd. Suite 500  
 Chicago, IL 60606-6938  
 www.pci.org

**MANDATORY REQUIREMENTS CHECKLIST**

Section/Part/Article	Notes to Specifier
2.1	Designate precast structural products.
4.1	Designate precast nonstructural architectural products.

**OPTIONAL REQUIREMENTS CHECKLIST**

Section/Part/Article	Notes to Specifier
1.1.1	The Specifier may require different product tolerances than listed in this Specification; however, more stringent tolerances may limit the number of producers able to supply the required precast members. See PCI MNL-135-00 for more guidance.
2.2	The Specifier may require different product tolerances. See PCI MNL-116-99 for more guidance.
3.2	The Specifier may require different product erection tolerances. See PCI MNL-127-99 for more guidance.
4.2	The Specifier may require different product tolerances. See PCI MNL-117-96 for more guidance.
5.2	The Specifier may require different product erection tolerances. See PCI MNL-127-99 for more guidance.



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# Specification for Tolerances for Precast Concrete

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