

## Deflection criteria from different countries.

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Ref: Australian Guidebook for Structural Engineers

Table 2.24 Deflection for concrete members

Type of member	Deflection to be considered	Deflection limitation ( $\Delta/L_{ef}$ ) for spans (Notes 1 and 2)	Deflection limitation ( $\Delta/L_{ef}$ ) for cantilevers (Note 4)
All members	The total deflection	1/250	1/125
Members supporting masonry partitions	The deflection that occurs after the addition or attachment of the partitions	1/500 where provision is made to minimise the effect of movement; otherwise, 1/1000	1/250 where provision is made to minimise the effect of movement; otherwise, 1/500
Members supporting other brittle finishes	The deflection that occurs after the addition or attachment of the finish	Manufacturer's specification, but not more than 1/500	Manufacturer's specification, but not more than 1/250
Members subjected to vehicular or pedestrian traffic	The imposed action (live and dynamic impact) deflection	1/800	1/400
Transfer members	Total deflection	1/500 where provision is made to minimise the effect of deflection of the transfer member on the supported structure; otherwise, 1/1000	1/250

Source: AS 3600, table 2.3.2. Copied by L. Pack with permission from Standards Australia under Licence 1607-c010.:

### Notes:

1. In general, deflection limits should be applied to all spanning directions. This includes, but is not limited to, each individual member and the diagonal spans across each design panel. For flat slabs with uniform loadings, only the column strip deflections in each direction need be checked.
2. If the location of masonry partitions or other brittle finishes is known and fixed, these deflection limits need only be applied to the length of the member supporting them. Otherwise, the more general requirements of Note 1 should be followed.
3. Deflection limits given may not safeguard against ponding.
4. For cantilevers, the values of  $\Delta/L_{ef}$  given in this table apply only if the rotation at the support is included in the calculation of  $\Delta$ .
5. Consideration should be given by the designer to the cumulative effect of deflections, and this should be taken into account when selecting a deflection limit.
6. When checking the deflections of transfer members and structures, allowance should be made in the design of the supported members and structures for the deflection of the supporting members. This will normally involve allowance for settling supports and may require continuous bottom reinforcement at settling columns.

Table 2.25 Suggested limits on calculated vertical deflections of beams

Type of beam	Deflection to be considered	Deflection limit ( $\Delta$ ) for span ( $l$ ) <sup>a</sup>	Deflection limit ( $\Delta$ ) for cantilever ( $l$ ) <sup>b</sup>
Beam supporting masonry partitions	The deflection which occurs after the addition or attachment of partitions	$\frac{\Delta}{l} \leq \frac{1}{500}$ where provision is made to minimise the effect of movement; otherwise, $\frac{\Delta}{l} \leq \frac{1}{1000}$	$\frac{\Delta}{l} \leq \frac{1}{250}$ where provision is made to minimise the effect of movement; otherwise, $\frac{\Delta}{l} \leq \frac{1}{500}$
All beams	The total deflection	$\frac{\Delta}{l} \leq \frac{1}{250}$	$\frac{\Delta}{l} \leq \frac{1}{125}$

Source: AS 4100, table B1. Copied by L. Pack with permission from Standards Australia under Licence 1607-c010.

<sup>a</sup> Suggested deflection limits in this table may not safeguard against ponding.

<sup>b</sup> For cantilevers, the values of  $\Delta/l$  given in this table apply, provided that the effect of the rotation at the support is included in the calculation of  $\Delta$ .

Table 2.26 Suggested limits on calculated horizontal deflections for industrial portal frame buildings

Type of construction	Relative deflection limitation	Absolute deflection limitation
Aluminium sheeting and no internal walls or ceilings (no crane)	Spacing/200	Spacing/150
Aluminium sheeting and no internal walls or ceilings (operating gantry crane)	Spacing/250	Spacing/250 (taken at crane height)
External masonry walls supported by steelwork and no internal walls or ceilings (no crane)	Spacing/200	Spacing/250

Source: AS 4100, Clause B2.

Note: Deflections are taken at the eaves height unless noted otherwise.

Table 15: Basic span/depth ratios given in BS 8110.

Support condition	Rectangular sections	Flanged beams with $b_w/b \leq 0.3$
Cantilever	7	5.6
Simply-supported	20	16
Continuous	26	20.8

Table 20: Comparison of span/effective depth ratio in various codes and guides for reinforcement yield stress = 460 N/mm<sup>2</sup>.

Code or guide	Cantilever	Simply-supported	Continuous		Flat slab	Comments
			End span	Internal span		
BS 8110 <sup>(1)</sup>	7	20	20	26		Basic span/depth ratios can be modified to take account of tension and compression reinforcement provided
IStructE 'Green Book' <sup>(39)</sup> IStructE 'Orange Book' <sup>(43)</sup>						
Eurocode 2 <sup>(2)</sup>						Basic span/depth ratio can be modified to take account of the tension reinforcement provided
Concrete highly stressed	7	15	20	22	18	
Concrete lightly stressed	9	22	28	33	26	
Model Code 90 <sup>(44)</sup>						
Concrete highly stressed	6	16	20	22	18	
Concrete lightly stressed	7	22	28	30	26	
CSA A23.3-94 <sup>(40)</sup>						Minimum thickness based on span/height ratio.  Deflection must be calculated for thinner members
One-way slabs	13	28	31	35		
One-way beams and ribbed slabs	10	19	22	26		
ACI 318-92 <sup>(41)</sup>						
One-way slabs	13	25	29	35		
One-way beams and ribbed slabs	9	19	22	24		
NS 3473 E <sup>(42)</sup>						Deflections must be calculated for thinner members
Beams	8	16	18	21		
One-way slabs	10	21	24	28		
Two-way slabs	-	24	28	32		

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Clause 23.2

- a) The final deflection due to all loads including the effects of temperature, creep and shrinkage and measured from the as-cast level of the , supports of floors, roofs and all other horizontal members, should not normally exceed span/250.
- b) The deflection including the effects of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less.

23.2.1 The vertical deflection limits may generally be assumed to be satisfied provided that the span to depth ratios are not greater than the values obtained as below:

- a) Basic values of span to effective depth ratios for spans up to 10 m:

Cantilever	7
Simply supported	20
Continuous	26
- b) For spans above 10 m, the values in (a) may be multiplied by  $l_0/\text{span}$  in metres, except for cantilever in which case deflection calculations should be made.
- c) Depending on the area and the stress of steel for tension reinforcement, the values in (a) or(b) shall be modified by multiplying with the modification factor obtained as per Fig. 4. (vide code for explanation).
- d) Depending on the' area of compression reinforcement, the value of span to depth ratio be further modified by multiplying with the modification factor obtained as per Fig. 5. (vide code for explanation).

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