

Table 14.1 Allowable Settlement

Type of Movement	Limiting Factor	Maximum Settlement
Total settlement	Drainage	6-12 in.
	Access	12-24 in.
	Probability of nonuniform settlement:	
	Masonry walled structure	1-2 in.
Tilting	Framed structures	2-4 in.
	Smokestacks, silos, mats	3-12 in.
	Stability against overturning	Depends on height and width
	Tilting of smokestacks, towers	0.004/l
	Rolling of trucks, etc.	0.01/l
	Stacking of goods	0.01/l
	Machine operation-cotton loom	0.003/l
	Machine operation-turbogenerator	0.0002/l
	Crane rails	0.003/l
	Drainage of floors	0.01-0.02/l
Differential movement	High continuous brick walls	0.0005-0.001/l
	One-story brick mill building, wall cracking	0.001-0.002/l
	Plaster cracking (gypsum)	0.001/l
	Reinforced-concrete building frame	0.0025-0.004/l
	Reinforced-concrete building curtain walls	0.003/l
	Steel frame, continuous	0.002/l
	Simple steel frame	0.005/l

From Sowers, 1962.

Note.  $l$  = distance between adjacent columns that settle different amounts, or between any two points that settle differently. Higher values are for regular settlements and more tolerant structures. Lower values are for irregular settlements and critical structures.

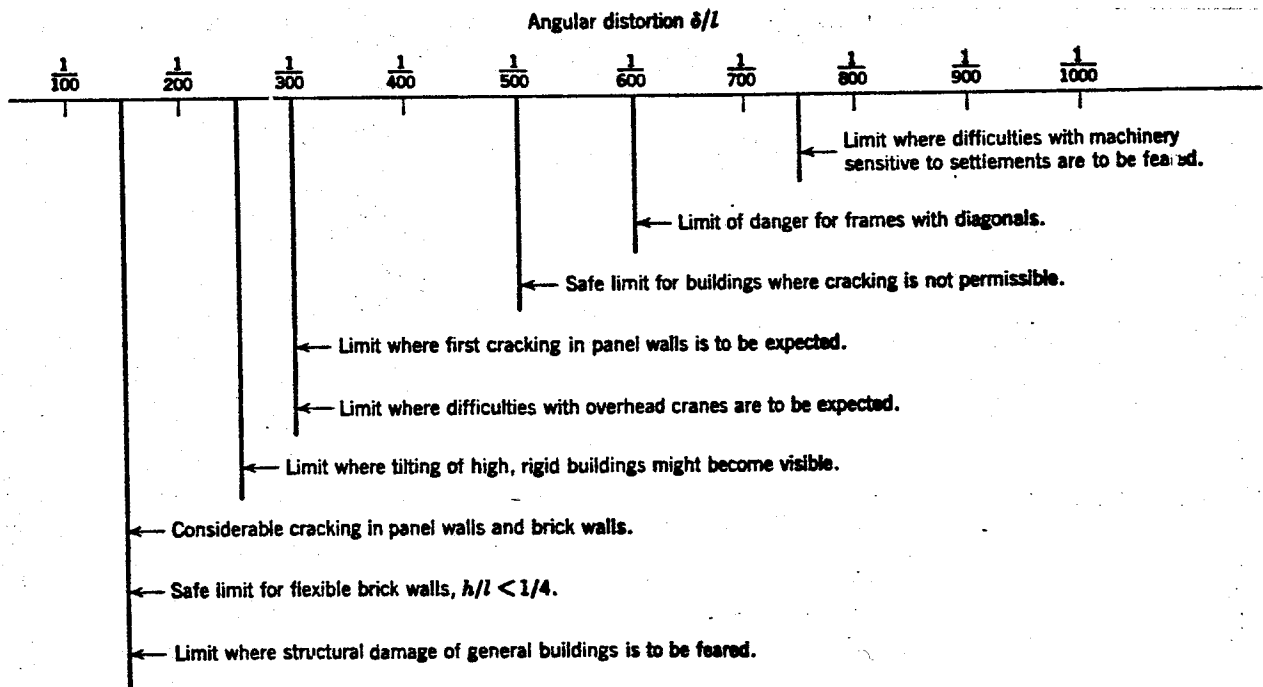
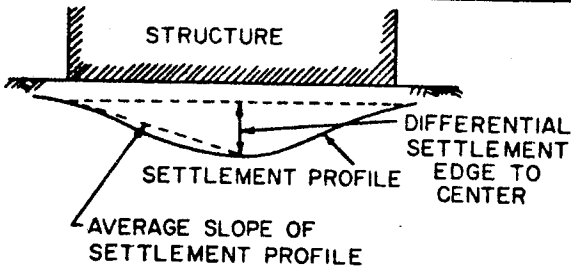


Fig. 14.8 Limiting angular distortions (From Bjerrum, 1963a).

## Tolerable Differential Settlements of Structures

Type of structure	Tolerable differential settlement	Qualifying conditions
Circular steel petroleum or fluid storage tanks:  Fixed top: Floating top:	(Units of radians of slope of settlement profile)  0.008 0.002 to 0.003 (depending on details of floating top).	Values apply to tanks on flexible base. Rigid slabs for base will not permit such settlement without cracking and local buckling.
Tracks for overhead traveling crane.	0.003	Value taken longitudinally along track. Settlement between tracks generally does not control.
Rigid circular mat or ring footing for tall and slender rigid structures such as stacks, silos, or water tanks.	0.002 (cross slope of rigid foundation)	
Jointed rigid concrete pressure pipe conduit.	0.015 (radians of angle change at joint)	Maximum angle change at joint is generally 2 to 4 times average slope of settlement profile. Damage to joint also depends on longitudinal extension.
One- or two-story steel frame, truss roof, warehouse with flexible siding.	0.006 to 0.008	Presence of overhead crane, utility lines, or operation of forklifts on warehouse floor would limit tolerable settlement.
One- or two-story houses with plain brick bearing walls and light structural frame.	0.002 to 0.003	Larger value is tolerable if significant portion of settlement occurs before interior finish is complete.
Structures with sensitive interior or exterior finish such as plaster, ornamental stone, or tile facing.	0.001 to 0.002	Larger value is tolerable if significant portion of settlement occurs before finish is complete.
Structures with relatively insensitive interior or exterior finish such as dry wall, movable panels, glass panels.	0.002 to 0.003	Damage to structural frame may limit tolerable settlements.
Multistory heavy concrete rigid frame on structural mat foundation 4 ft ± thick.	0.0015	Damage to interior or exterior finish may limit tolerable settlements.
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Tolerable differential settlement is expressed in terms of slope of settlement profile</p> <p>Value of 0.001 = 1/4-in. differential settlement in 20-ft distance</p> <p>Value of 0.008 = 2-in. differential settlement in 20-ft distance</p> </div> </div>		