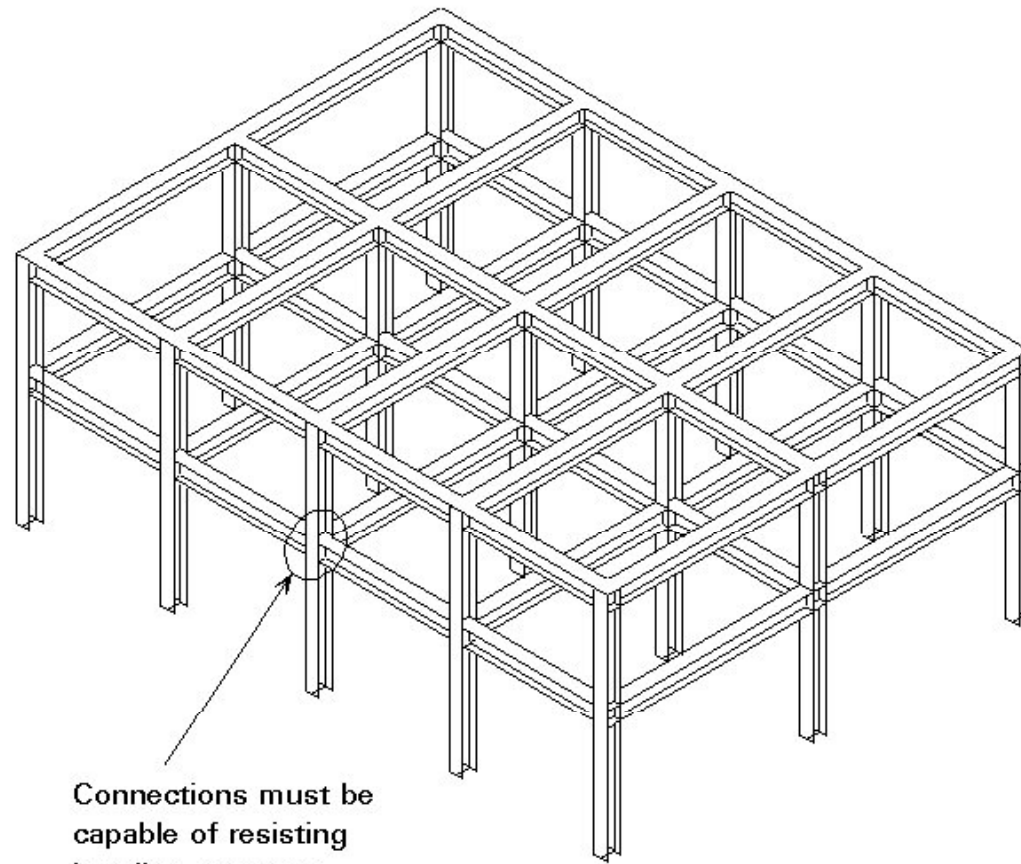


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Fakulteta za gradbeništvo in geodezijo
Katedra za metalne konstrukcije*

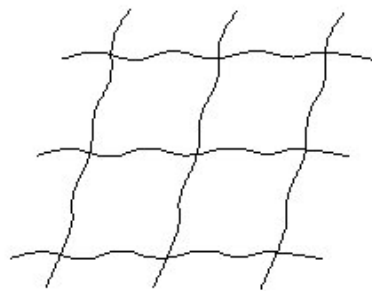
JEKLENE STAVBE IN MOSTOVI

VISOKE STAVBE

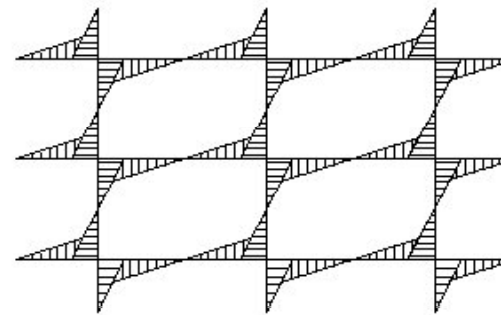
prof. dr. Darko Beg



Connections must be capable of resisting bending moments



Deformed shape



Bending moment diagram



Figure 15 Sway frames

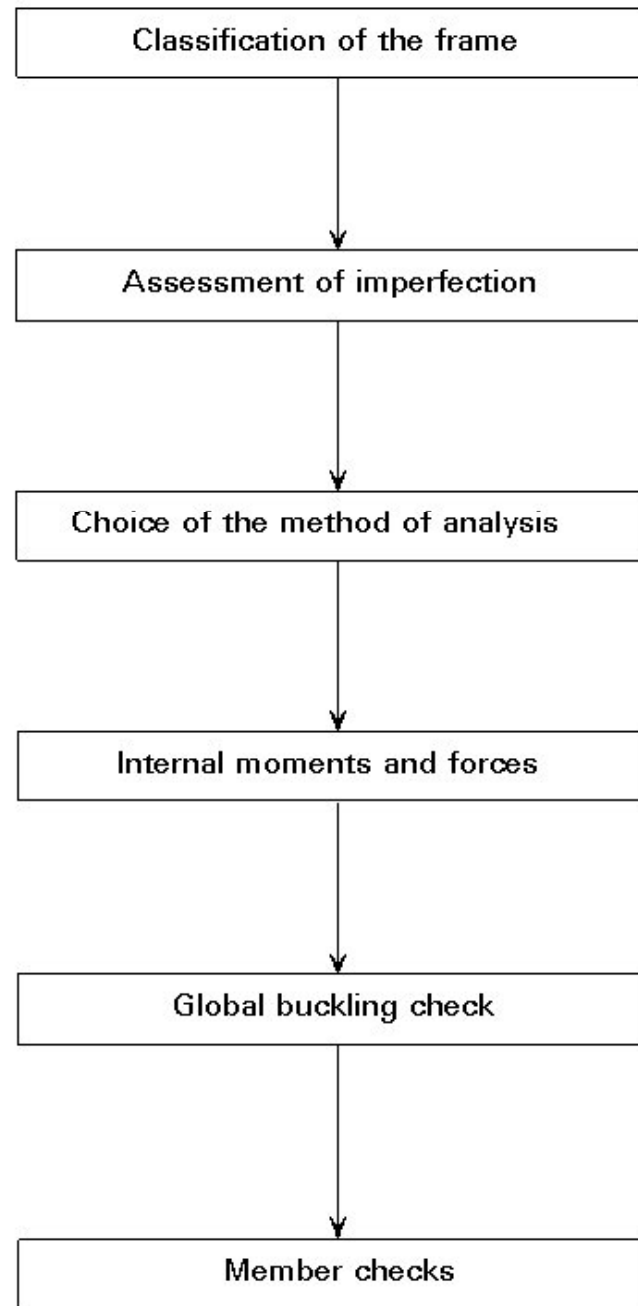


Figure 1 Procedure for analysis of frames

NON-SWAY		SWAY		FRAME CLASSIFICATION
Braced	Unbraced	Braced	Unbraced	5.2.5.2 and 5.2.5.3
First order elastic analysis		First order elastic analysis with indirect allowance for second order effects 5.2.6.2		Methods of global analysis
Second order elastic analysis				
First order plastic analysis		First order (rigid-) plastic analysis with indirect allowance for second-order effects in specific cases 5.2.6.3		
Second order plastic analysis				
				5.2.1

Figure 2 Choice of the method of analysis with reference to Eurocode 3

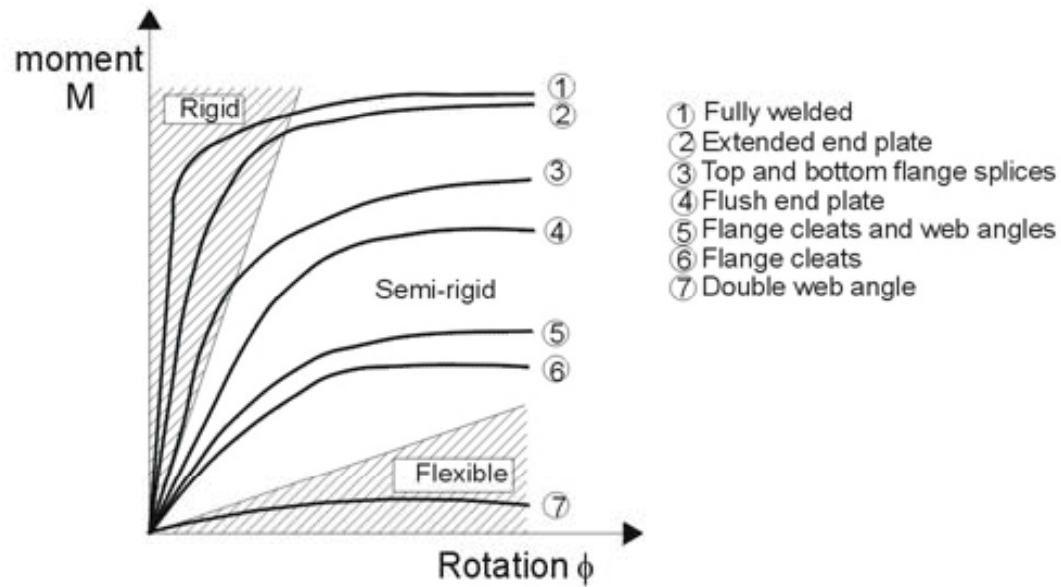
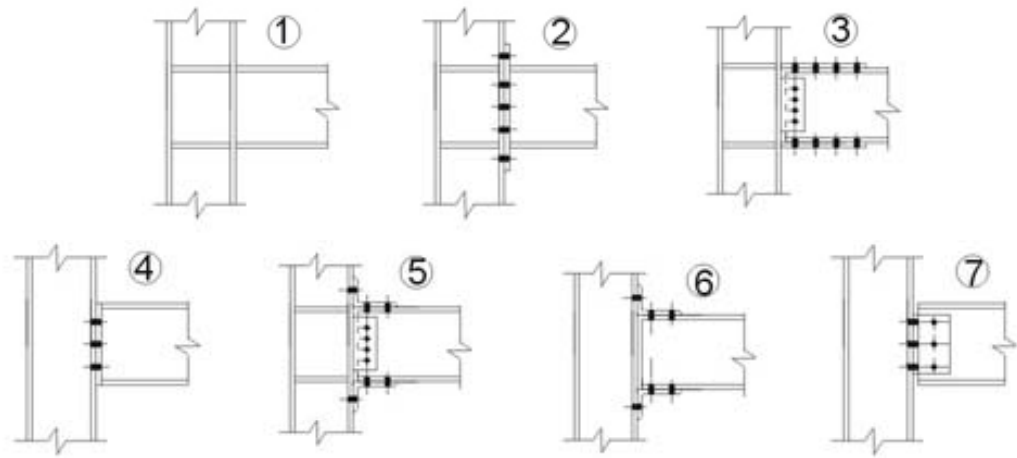


Figure 3 Experimental $M-\phi$ relations of connections.

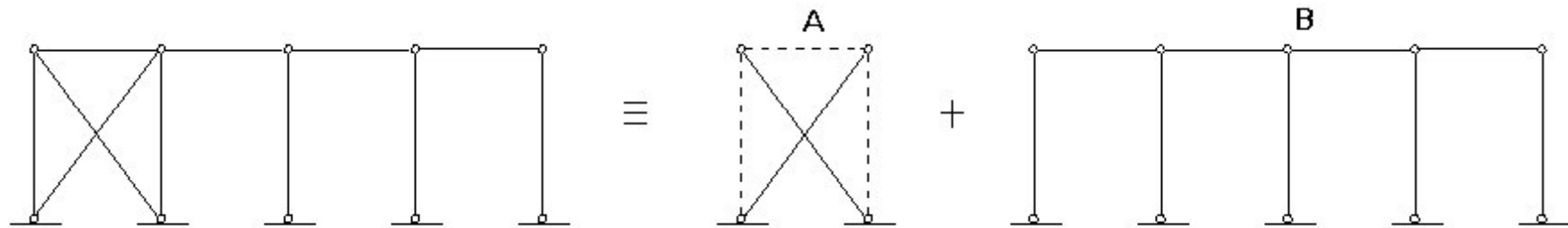


Figure 5 Pinned connection structure split into two sub-assemblies

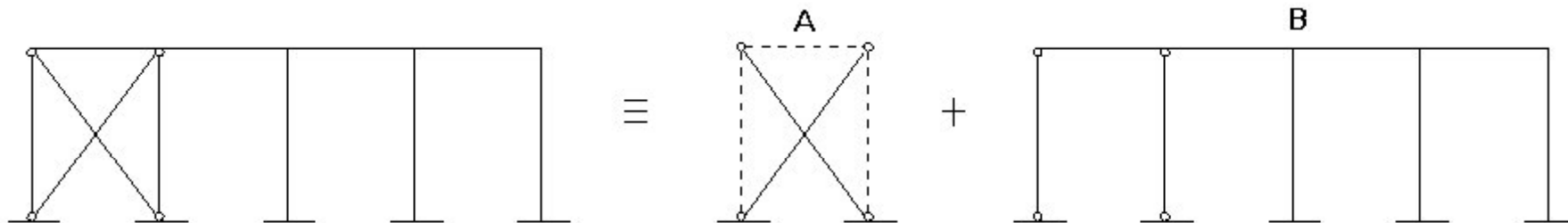


Figure 6 Partly framed structure split into two sub-assemblies

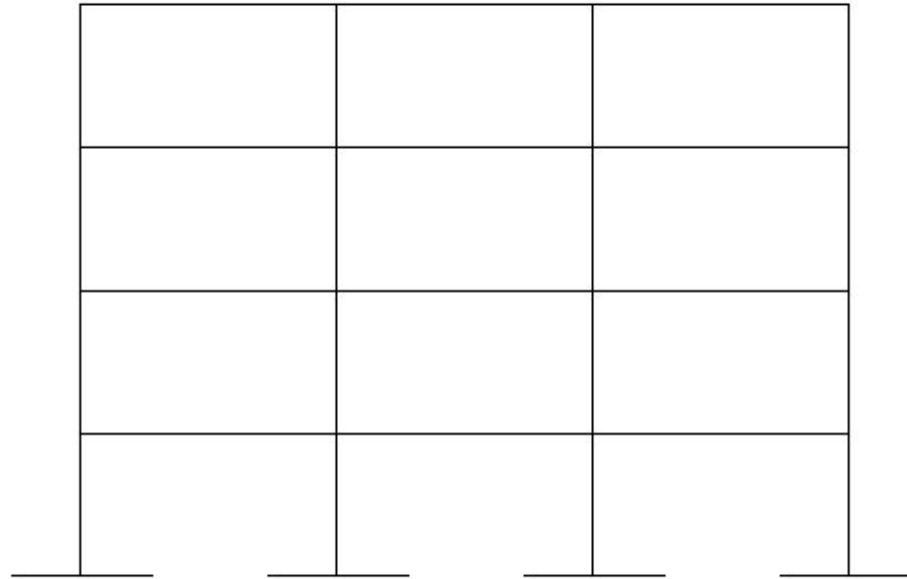


Figure 8 Unbraced frame (but may be a non-sway frame if it is sufficiently rigid i.e. insensitive to horizontal loading).

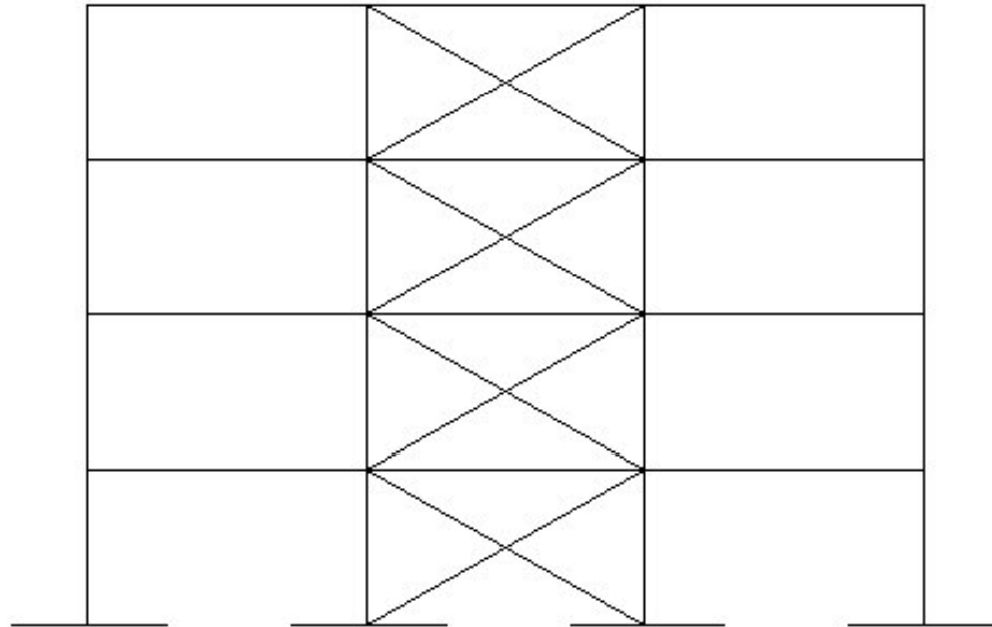


Figure 7 Braced frame (but may be a sway frame if bracing is very flexible).

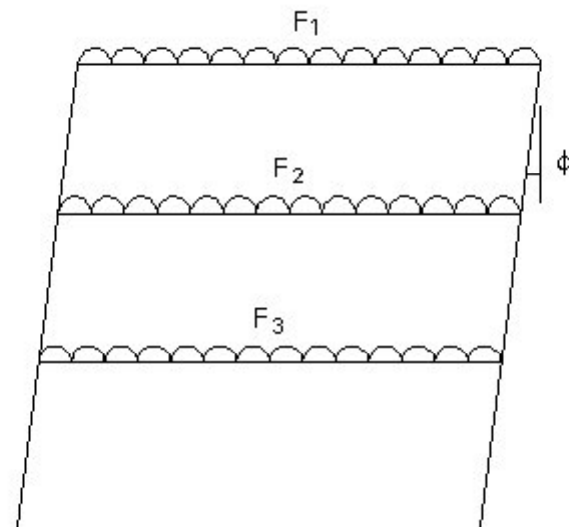


Figure 7 Initial sway rotation ϕ to allow for frame imperfections

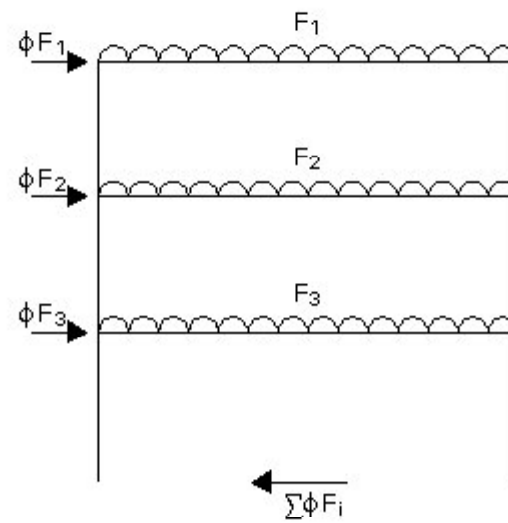


Figure 8 The equivalent horizontal forces due to sway imperfections

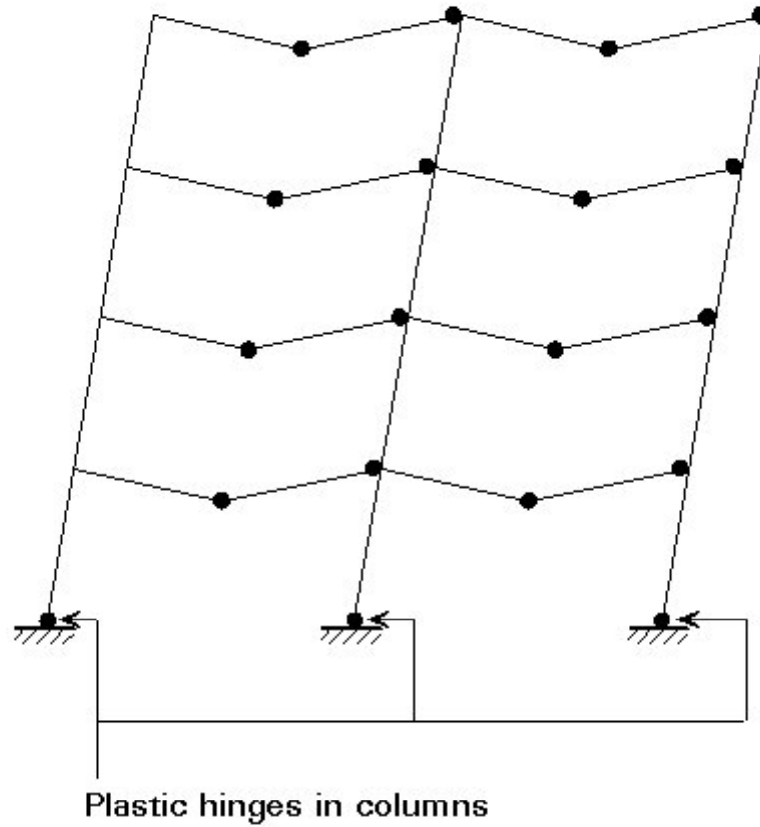


Figure 15 Plastic global analysis of frame

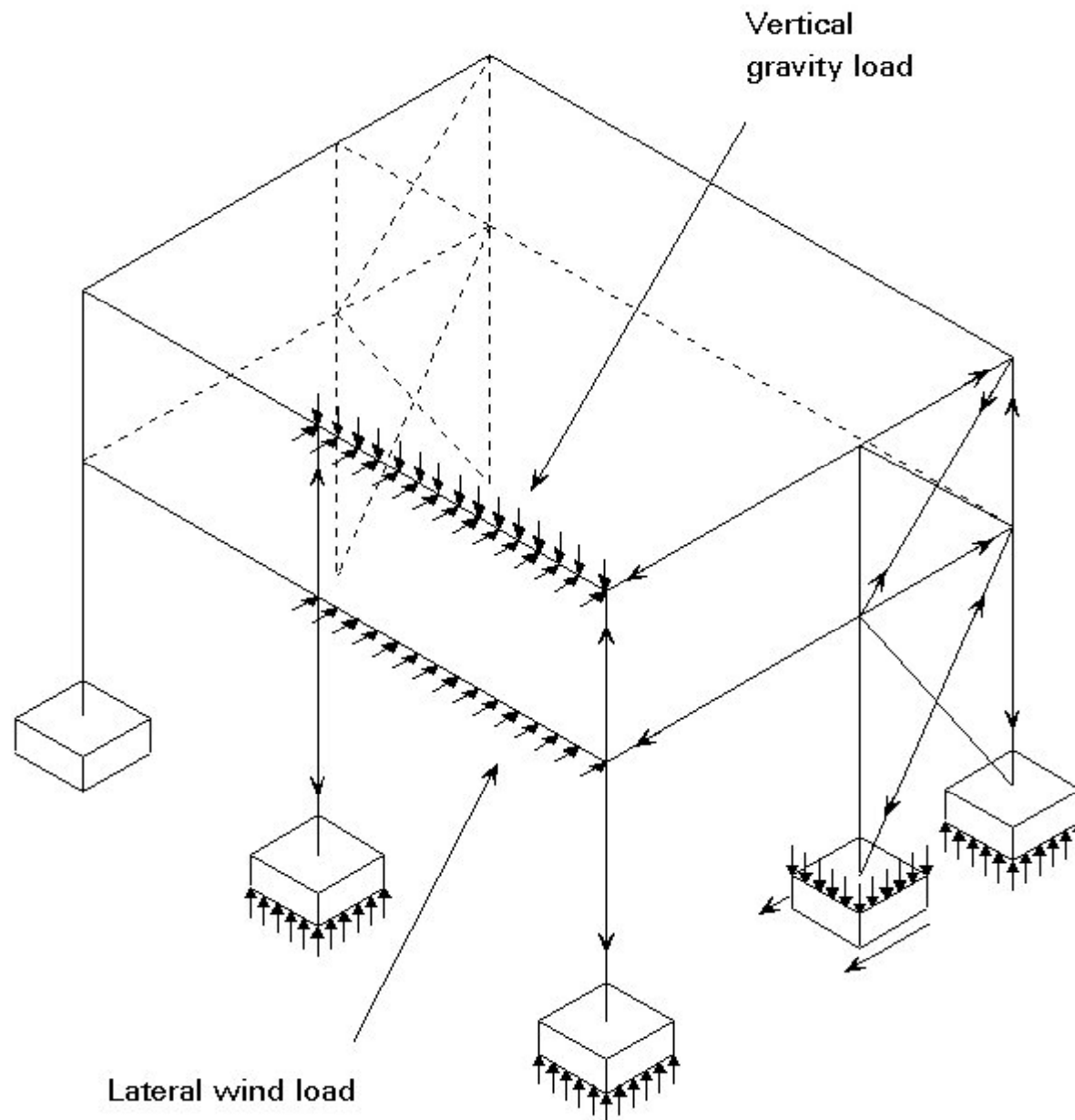


Figure 2 Transfer of external actions to foundations.

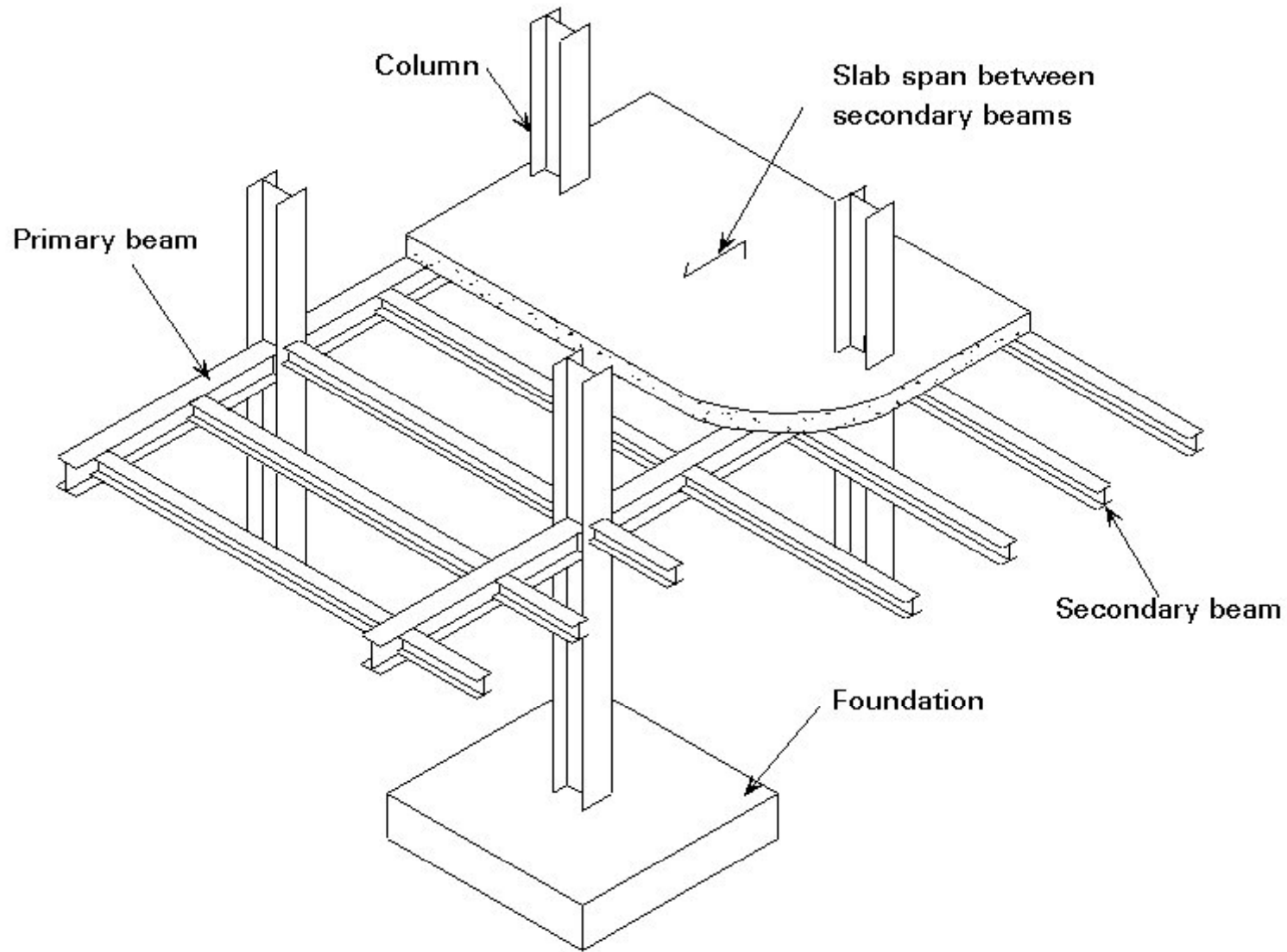


Figure 1 Typical structure

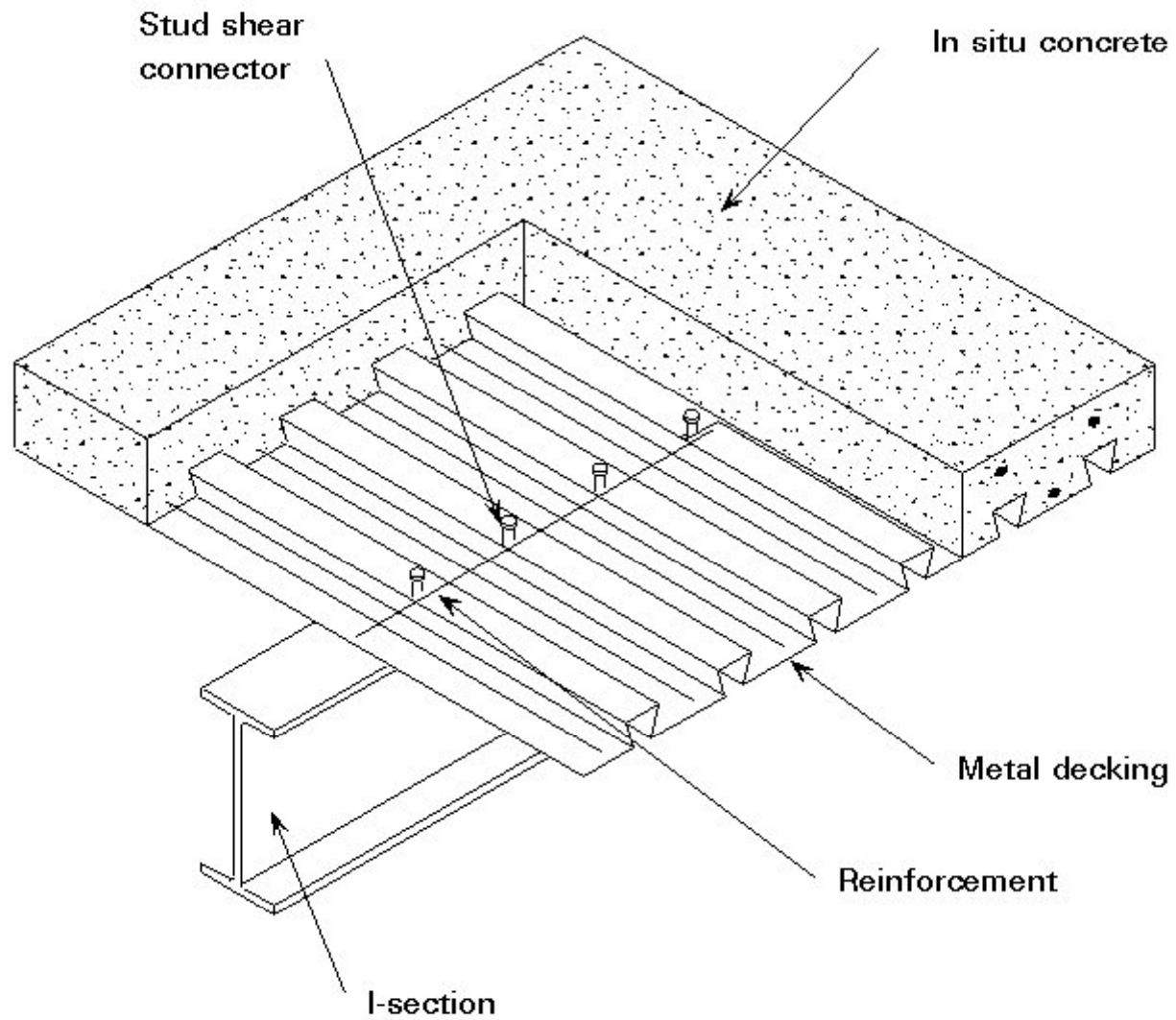


Figure 2 Concrete floor on steel decking

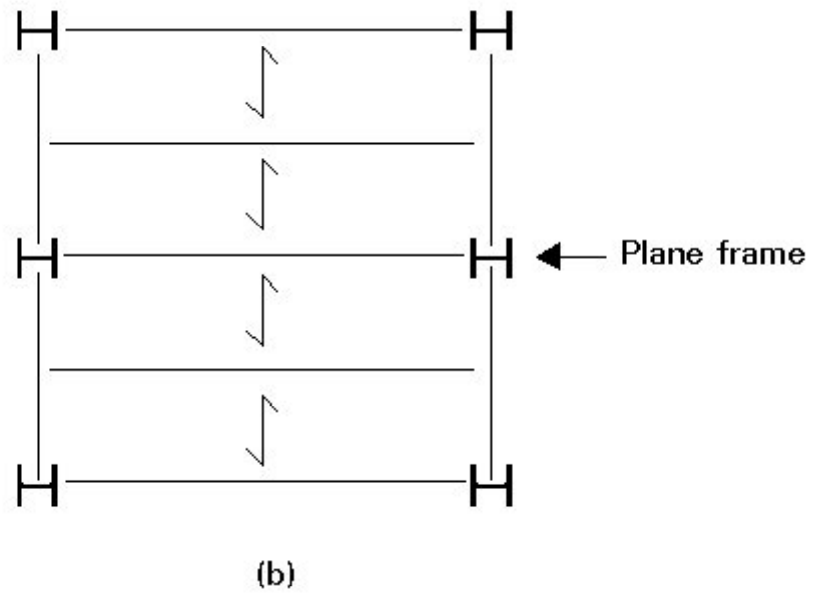
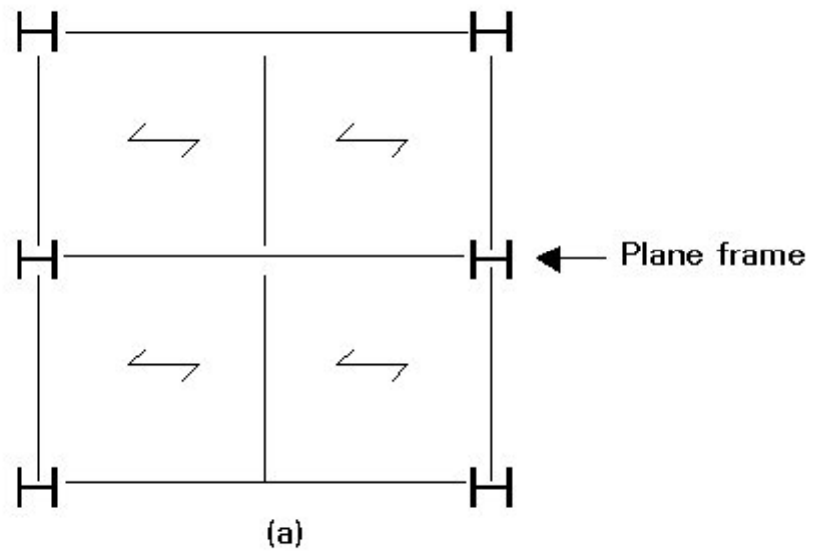
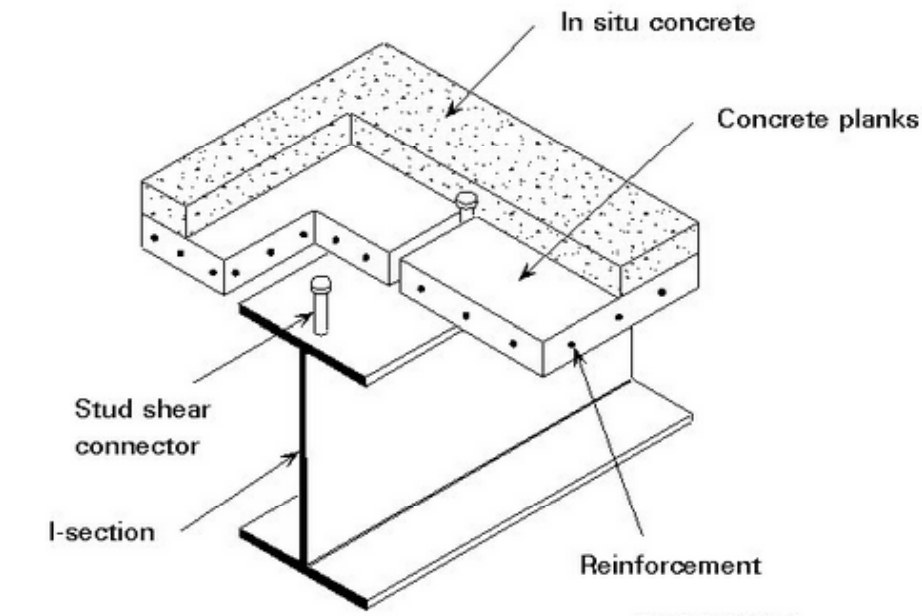
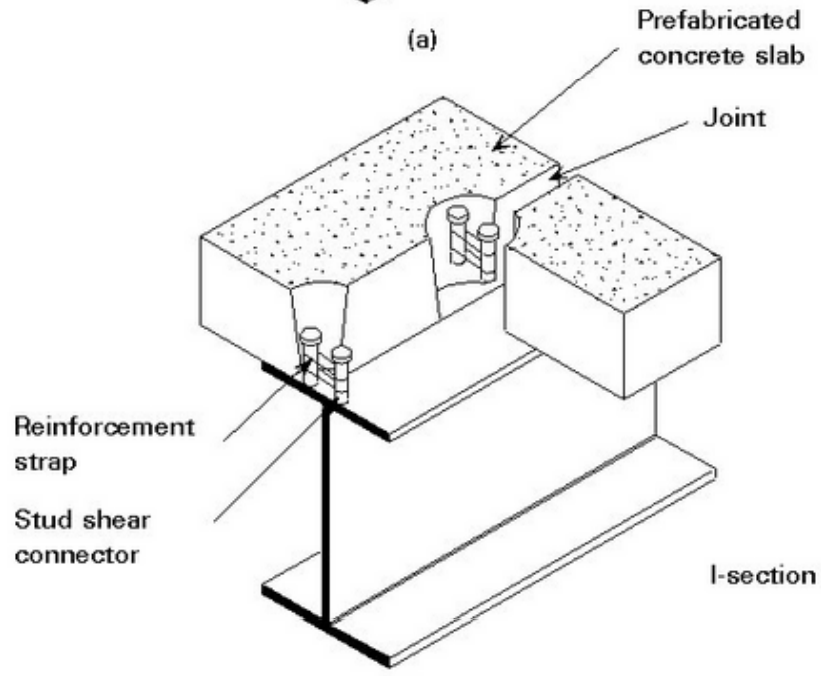


Figure 6 Grid of primary and secondary beams



(a)



(b)

Figure 3 Precast concrete floor systems



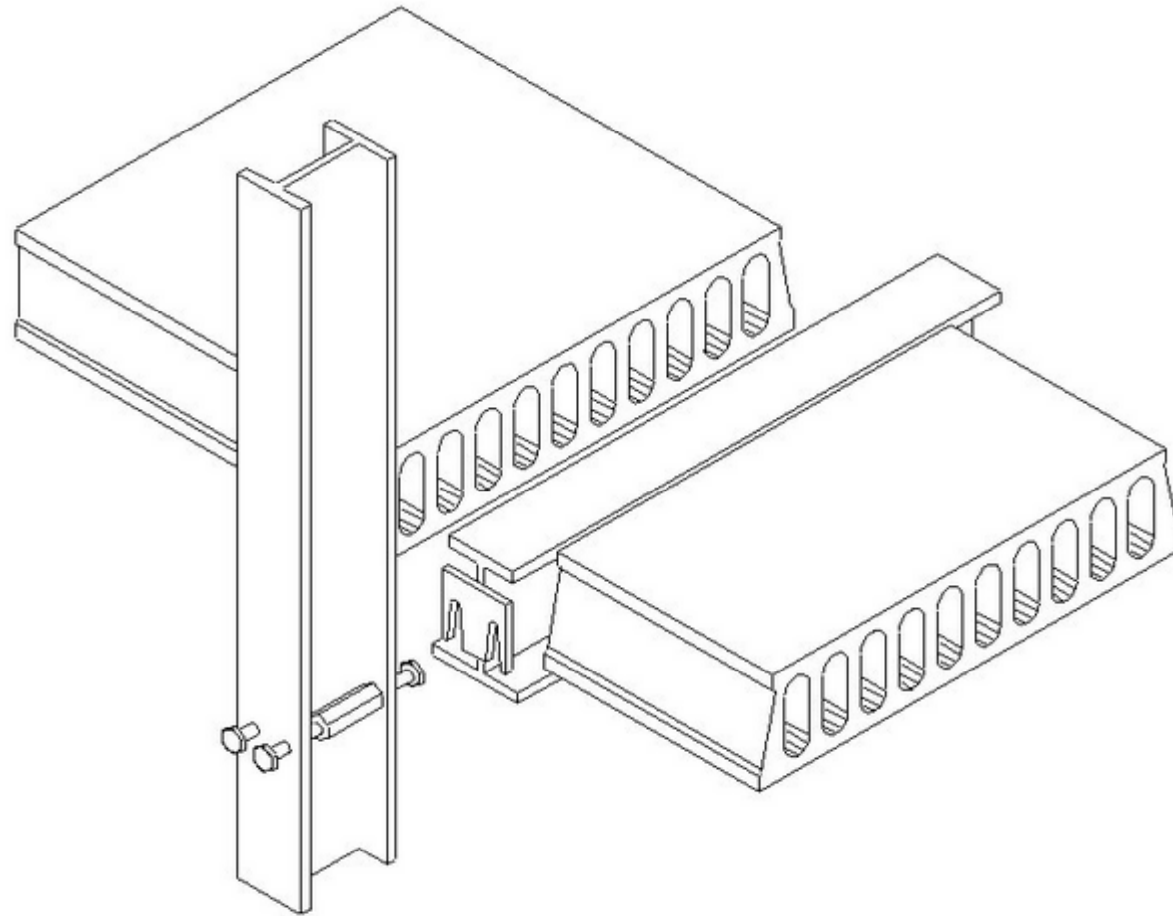
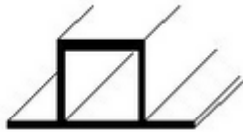


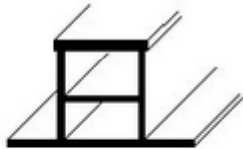
Figure 4 'Slim floor' system



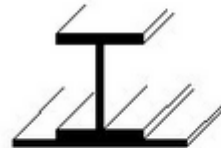
THQ(PPTH) Jorspronkelijke



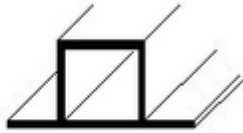
HE-L semi-geintereerde ligger



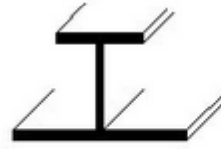
NSQ (Norretalje Svets)



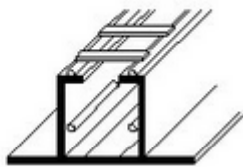
SFB (British Steel) slim floor beam



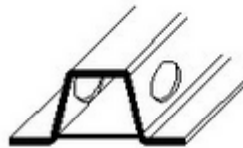
TBB (Tibnor)



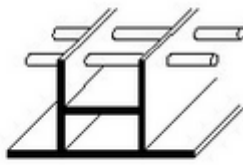
IFB (Arbed) Integrated floor beam



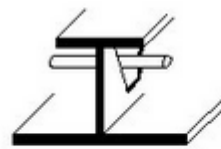
WT (Fundia bygg/construc thor)



Deltabeam staa-betonligger



Msq staa-betonligger



MSI staa-betonligger

Figure 5a Integrated steel beams for 'slim floor' systems

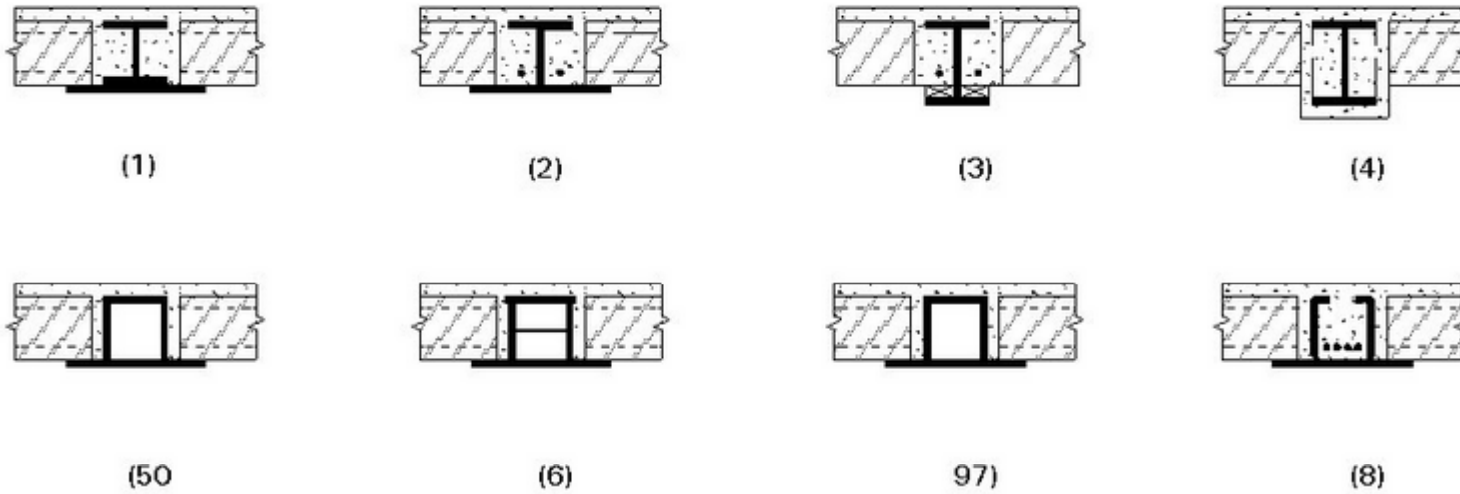
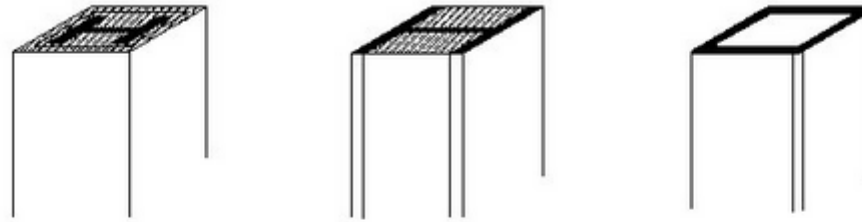
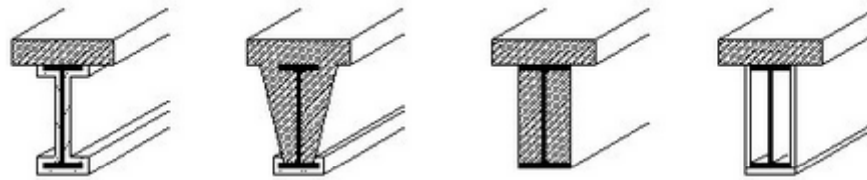


Figure 5b Integrated steel beams for 'slim floor' systems



(a) Column



(b) Beams

Figure 6 Typical solutions for fire protection

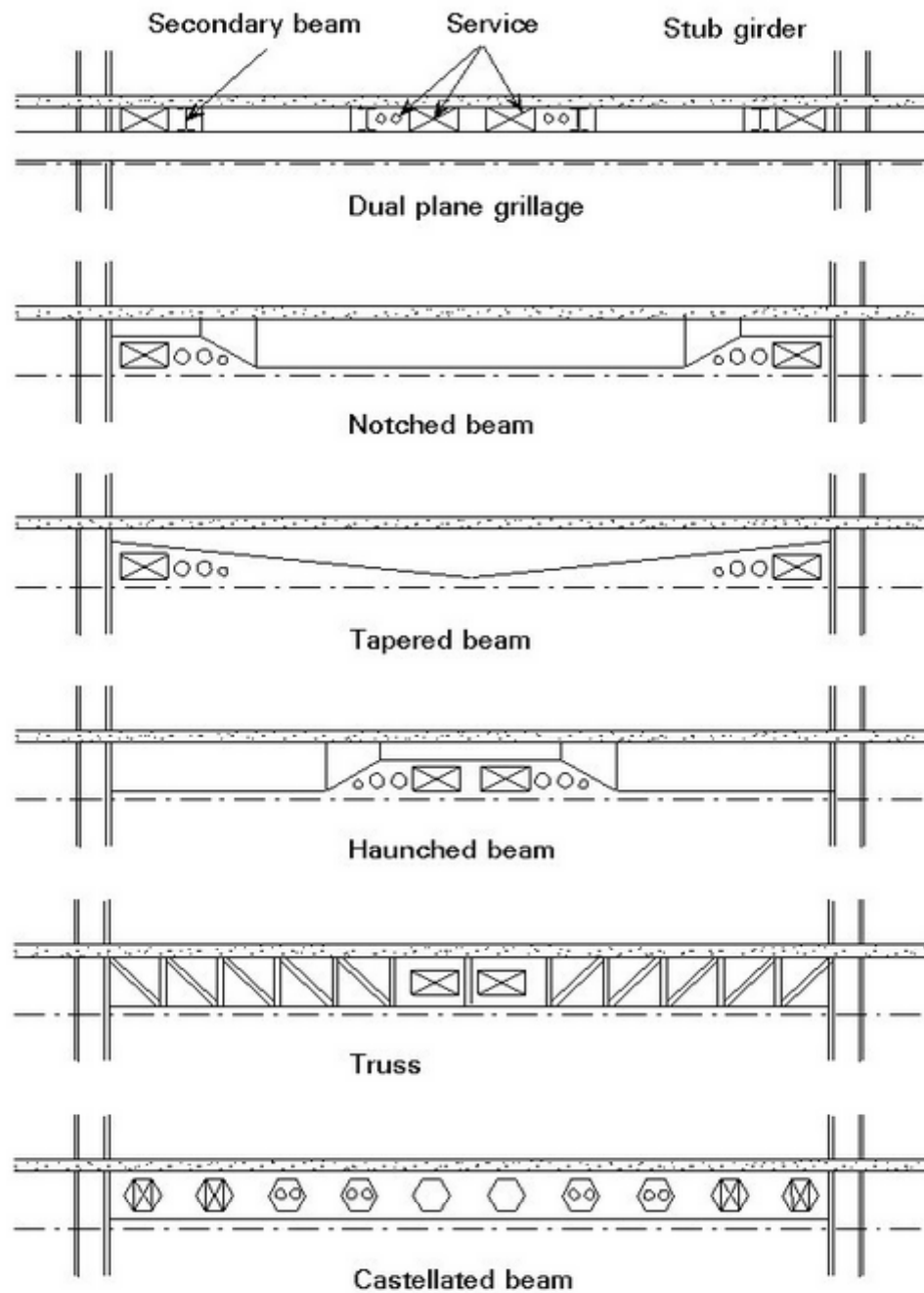


Figure 7 Accommodation of Services

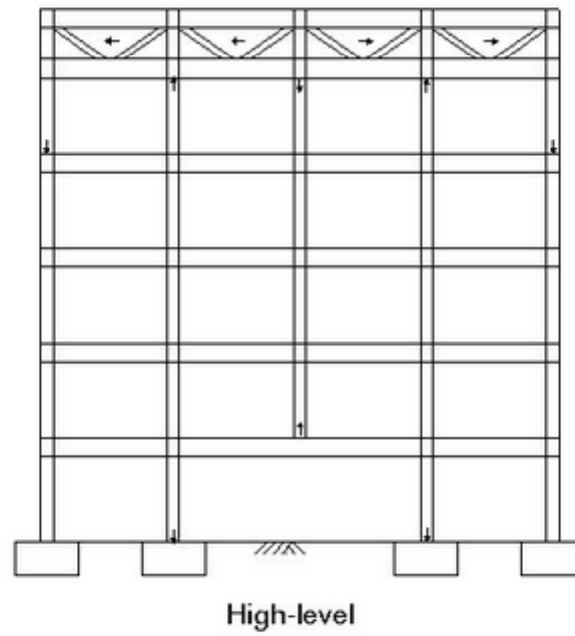
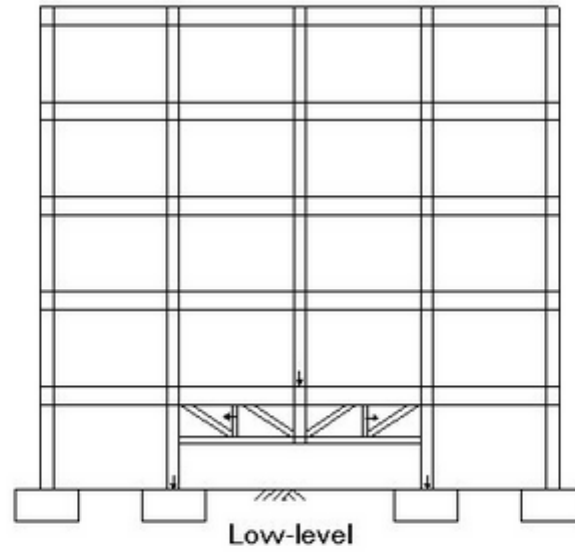
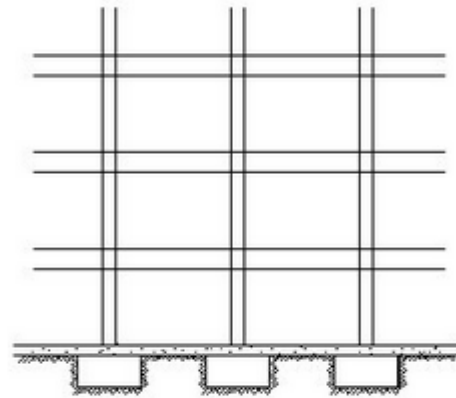
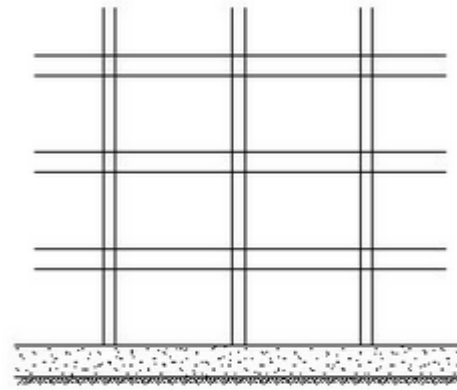


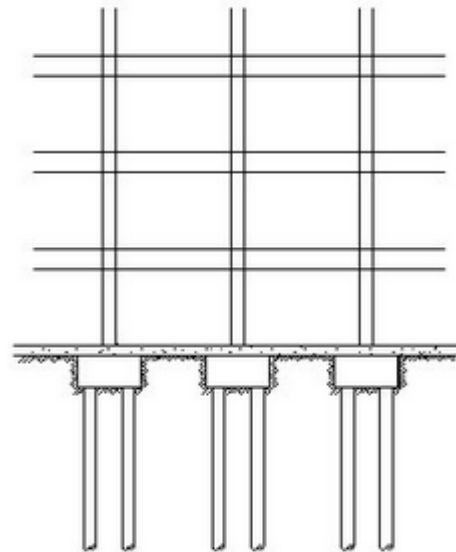
Figure 8 Transfer beams



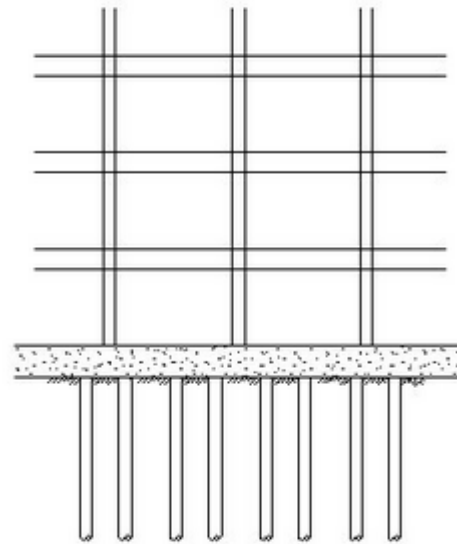
Pad footing



Raft



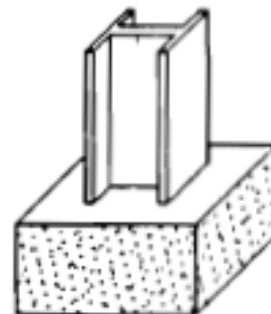
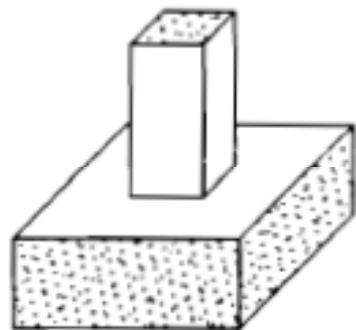
Pile caps



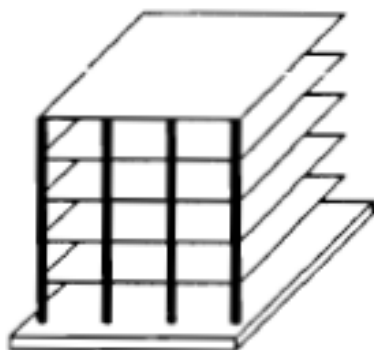
Pile raft

Figure 9 Foundation types

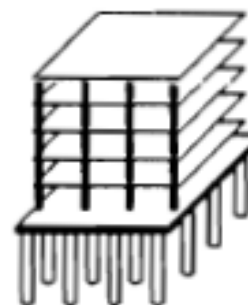




20% reduction
approximate



raft foundation



piled foundation

Foundation savings

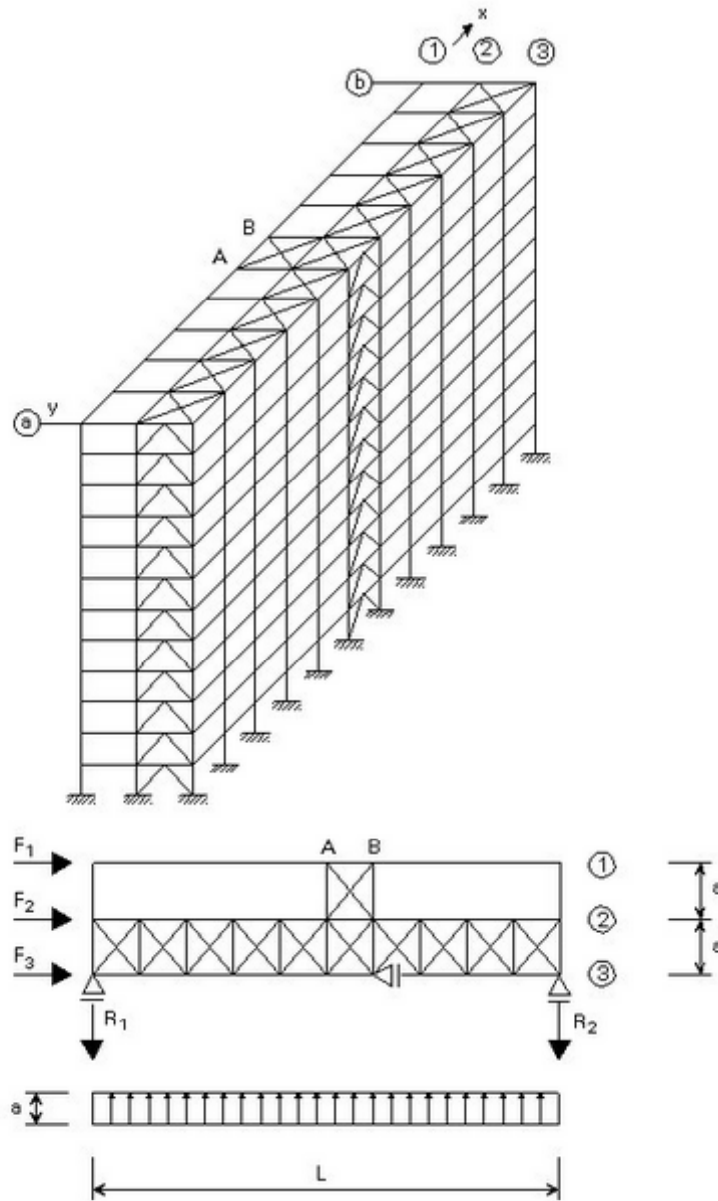


Figure 10 Stabilizing system with steel bracings

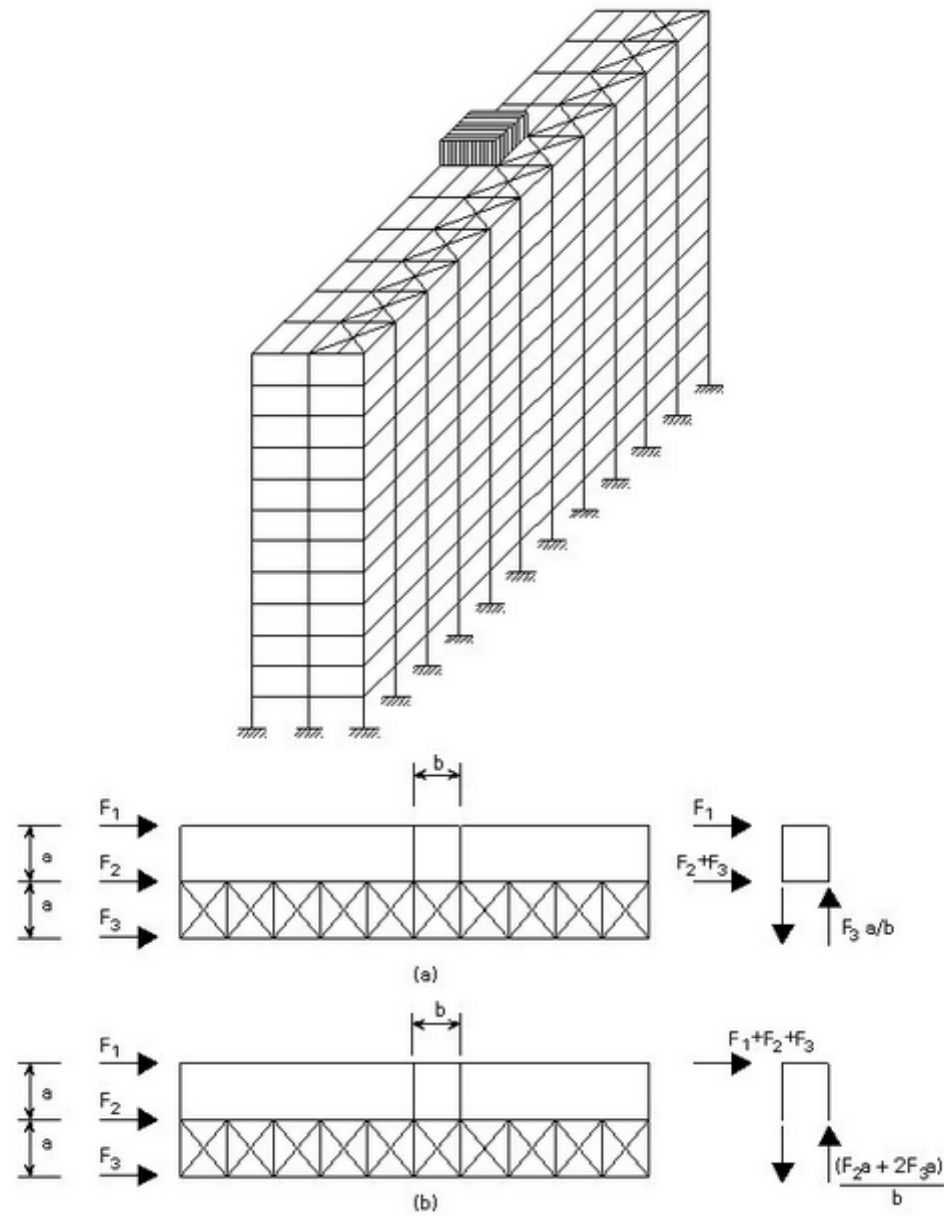
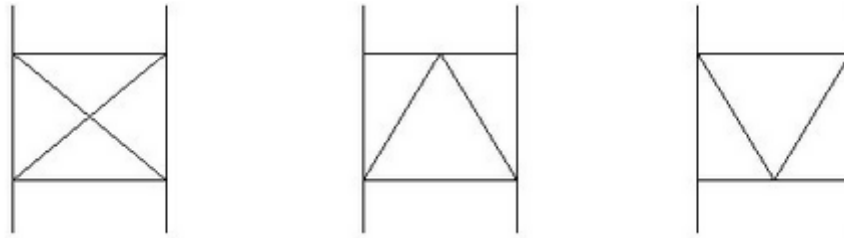
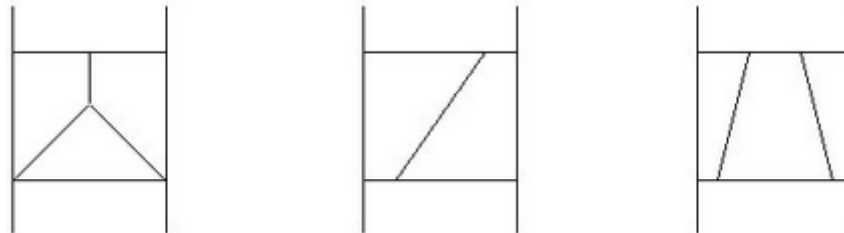


Figure 11 Stabilizing system with reinforced concrete core



(a) Concentric bracings



(b) Eccentric bracings

Figure 12 Typical steel bracing meshes

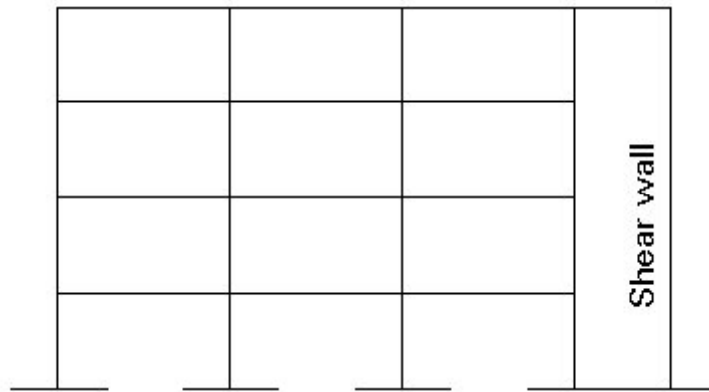
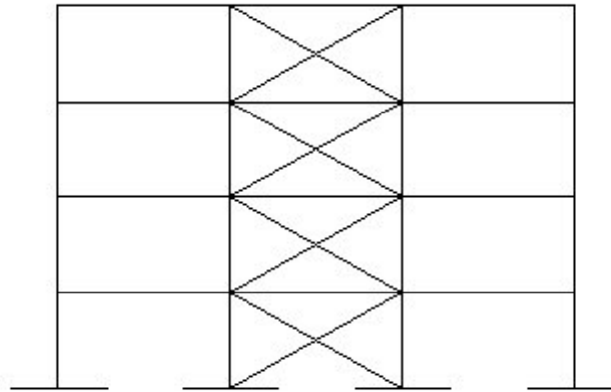
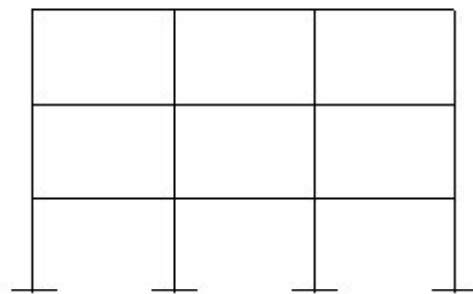


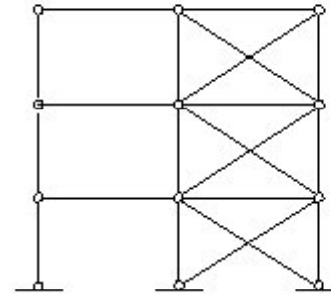
Figure 1 Common bracing systems.



Column



Frame



Truss



Shear wall

Figure 2 Systems which can be considered as bracings

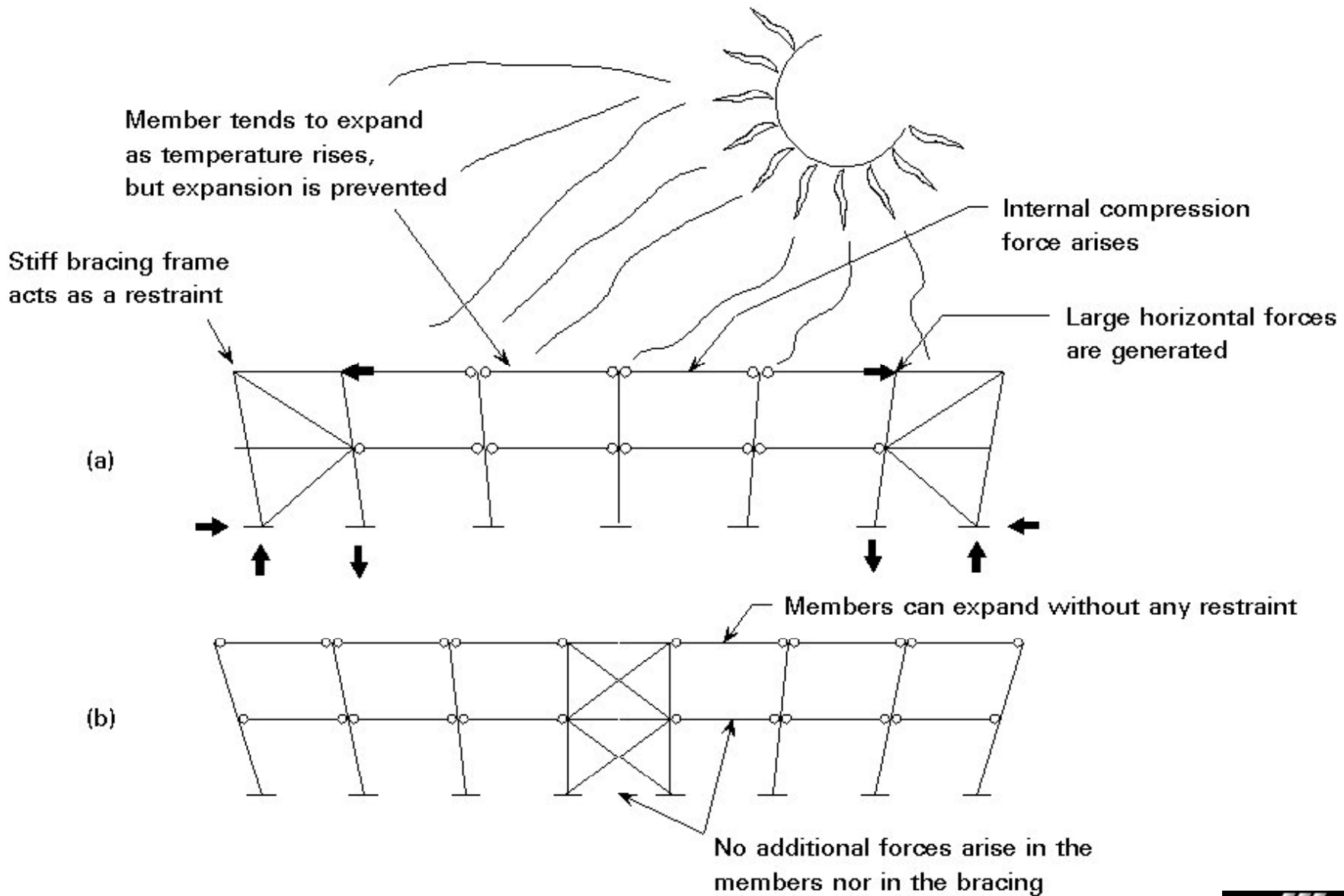


Figure 5 Effects of thermal expansion on braced structures

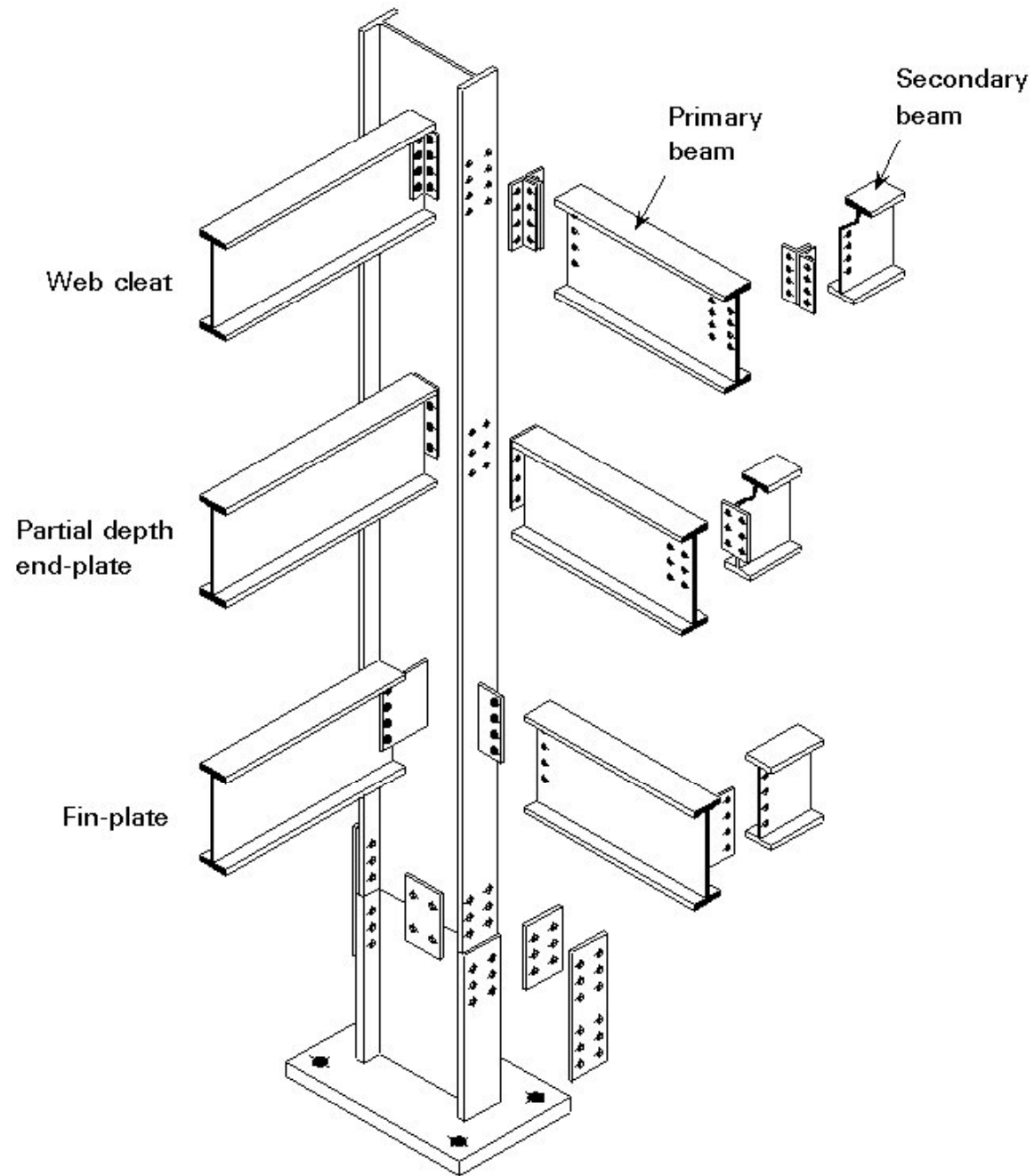
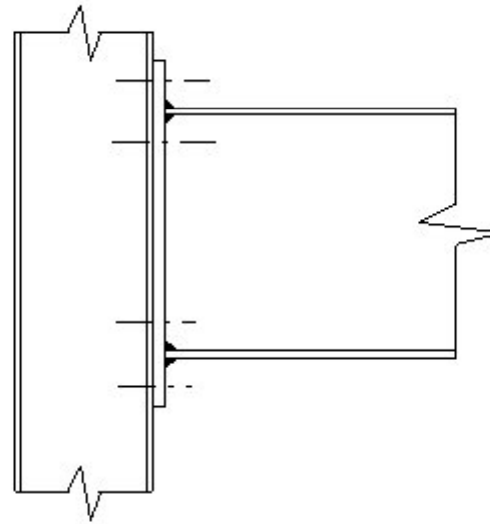
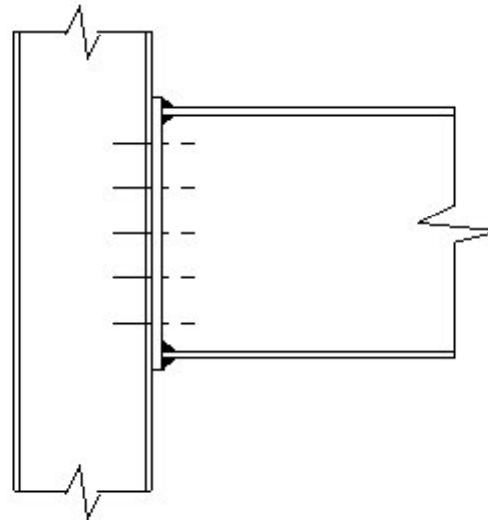


Figure 11 Types of simple connection.



(a) Extended end plate



(b) Flush end plate

Figure 7 End plate connections

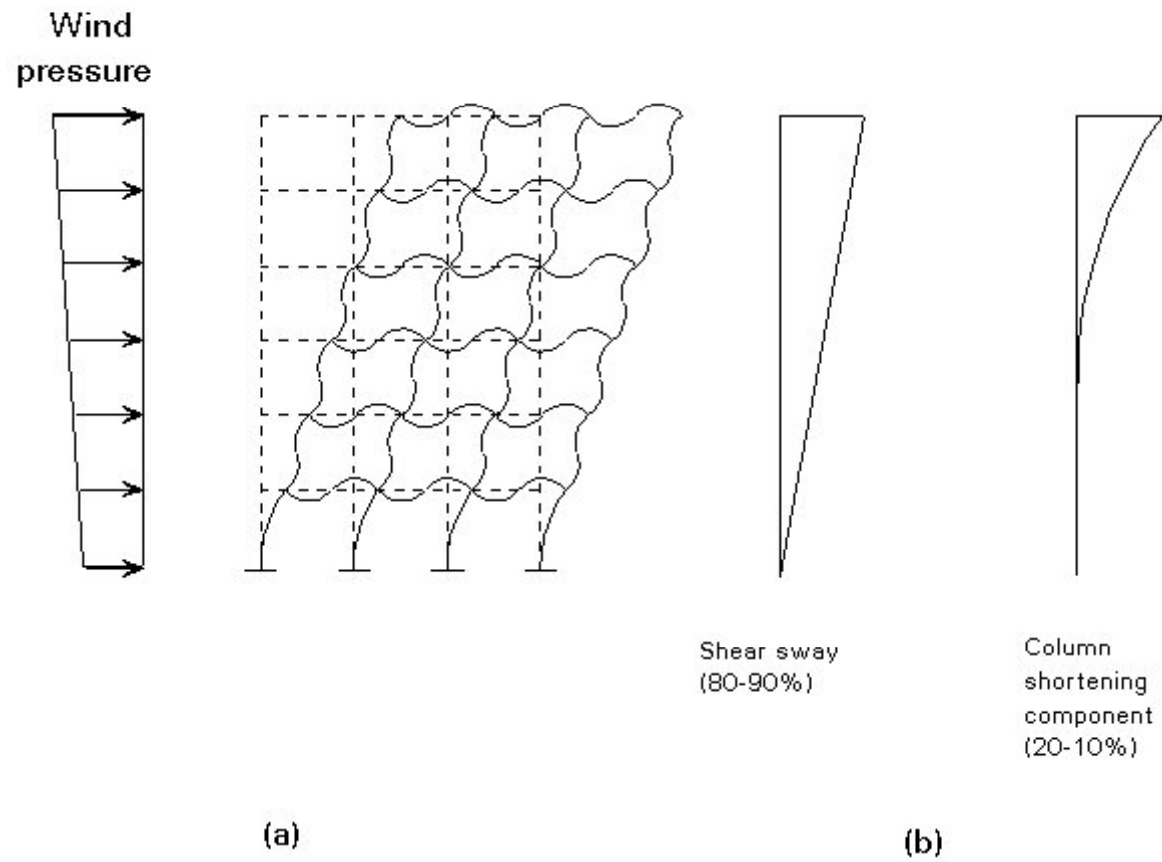


Figure 2 Frame sway

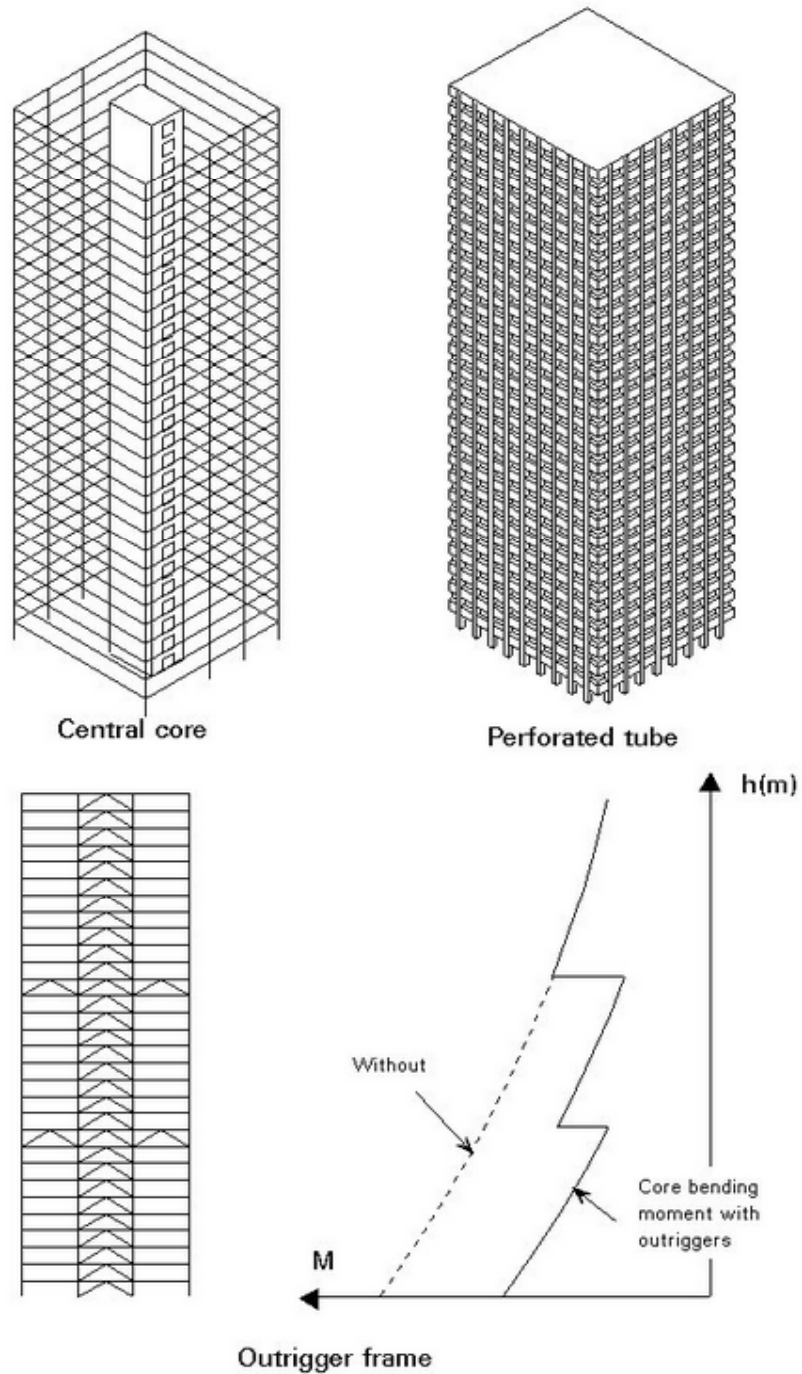
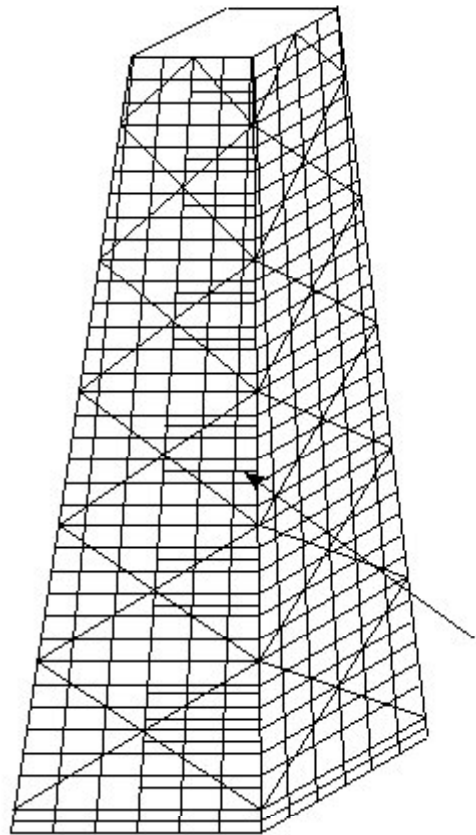
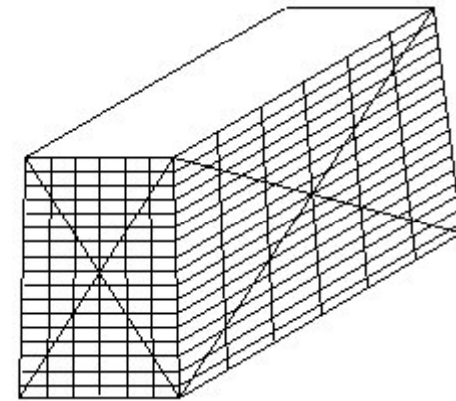


Figure 16 Bracing systems for tall buildings

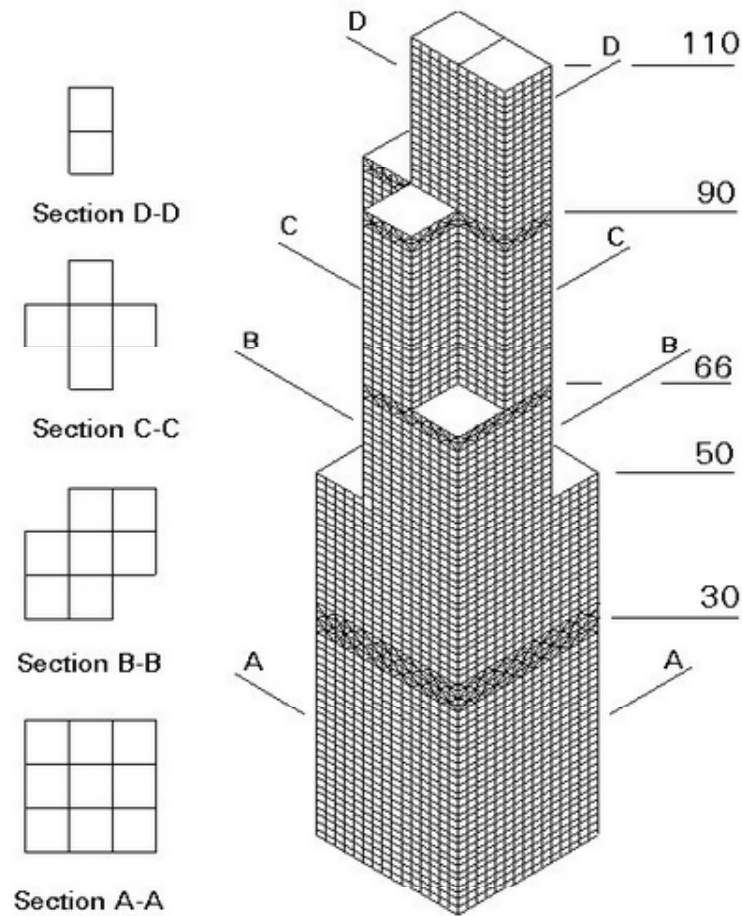


Column axial stress
under wind only
(one quarter shown)

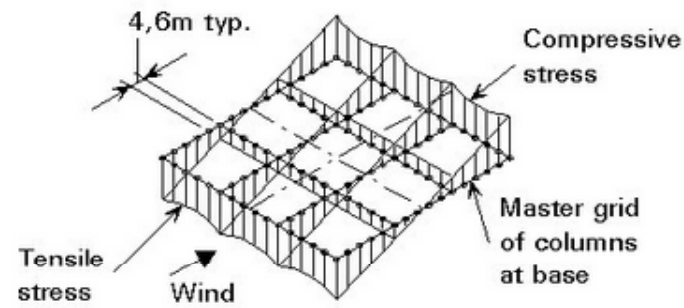


Base tier module

Figure 9b Diagonallized tube



(a) Modular floor configurations



(b) Shear lag behaviour

Figure 10 Sears Tower, Chicago, Illinois

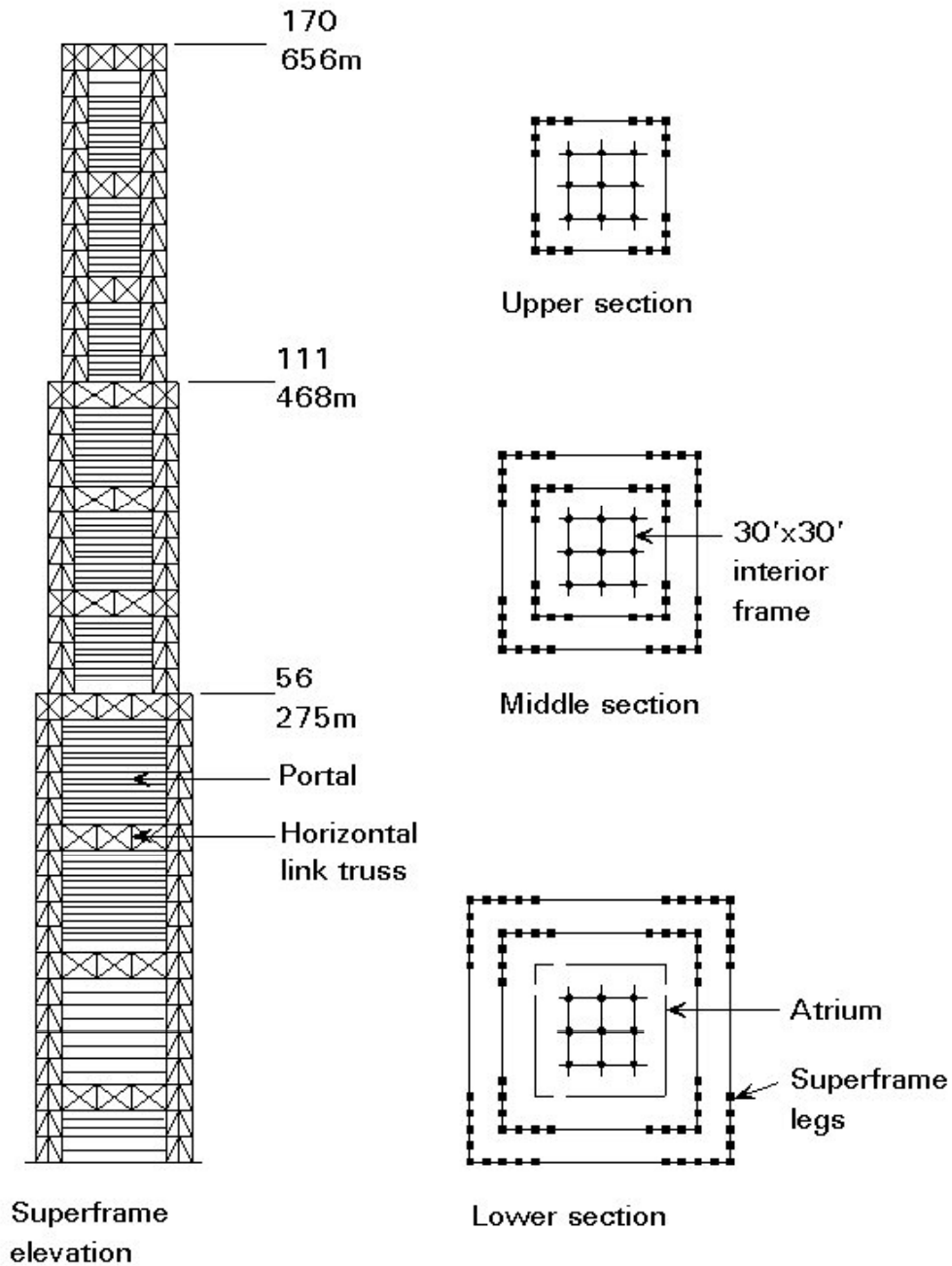


Figure 15 Superframe structure, Chicago (proposal) : Frame details

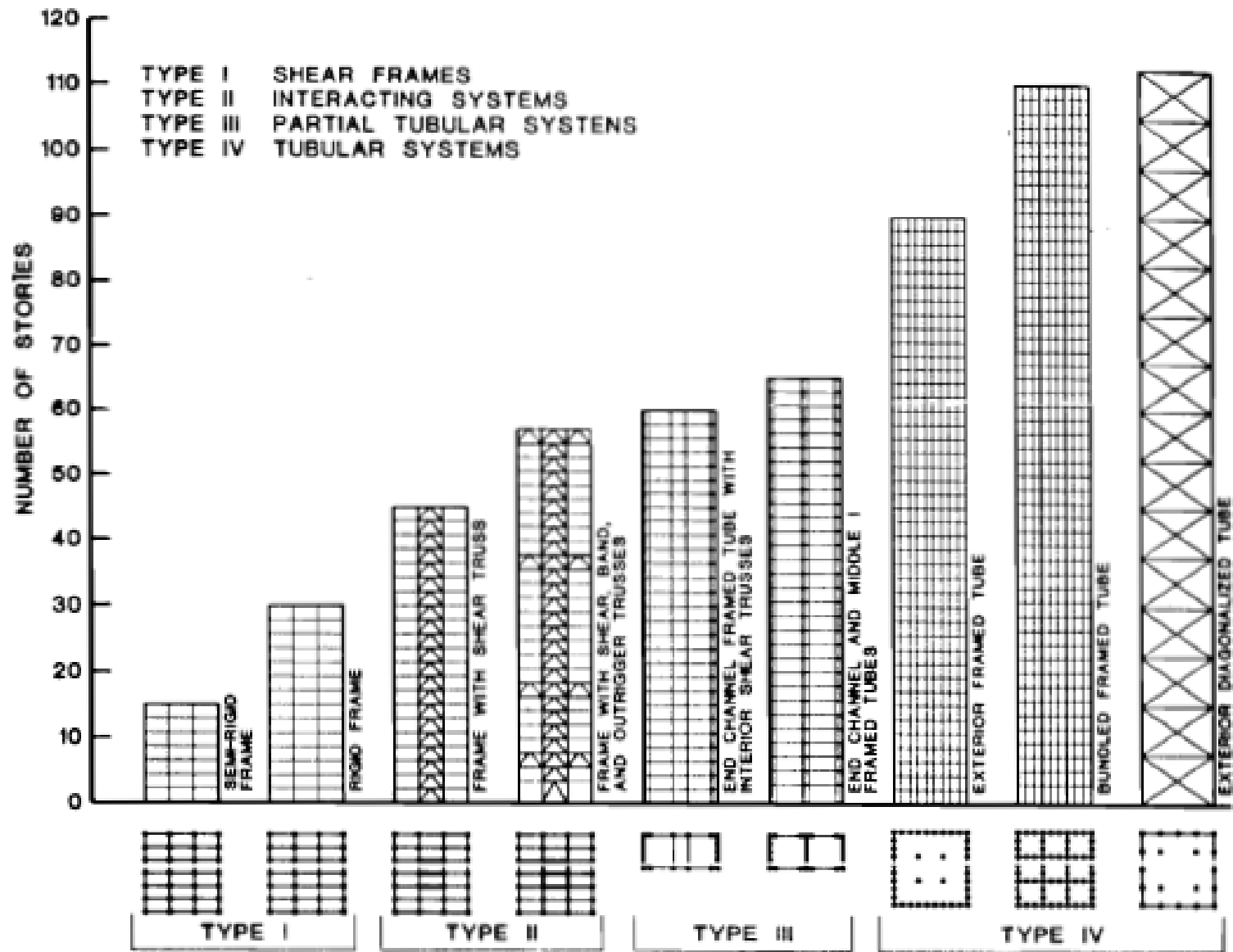


Fig. 2. Comparison of structural systems.

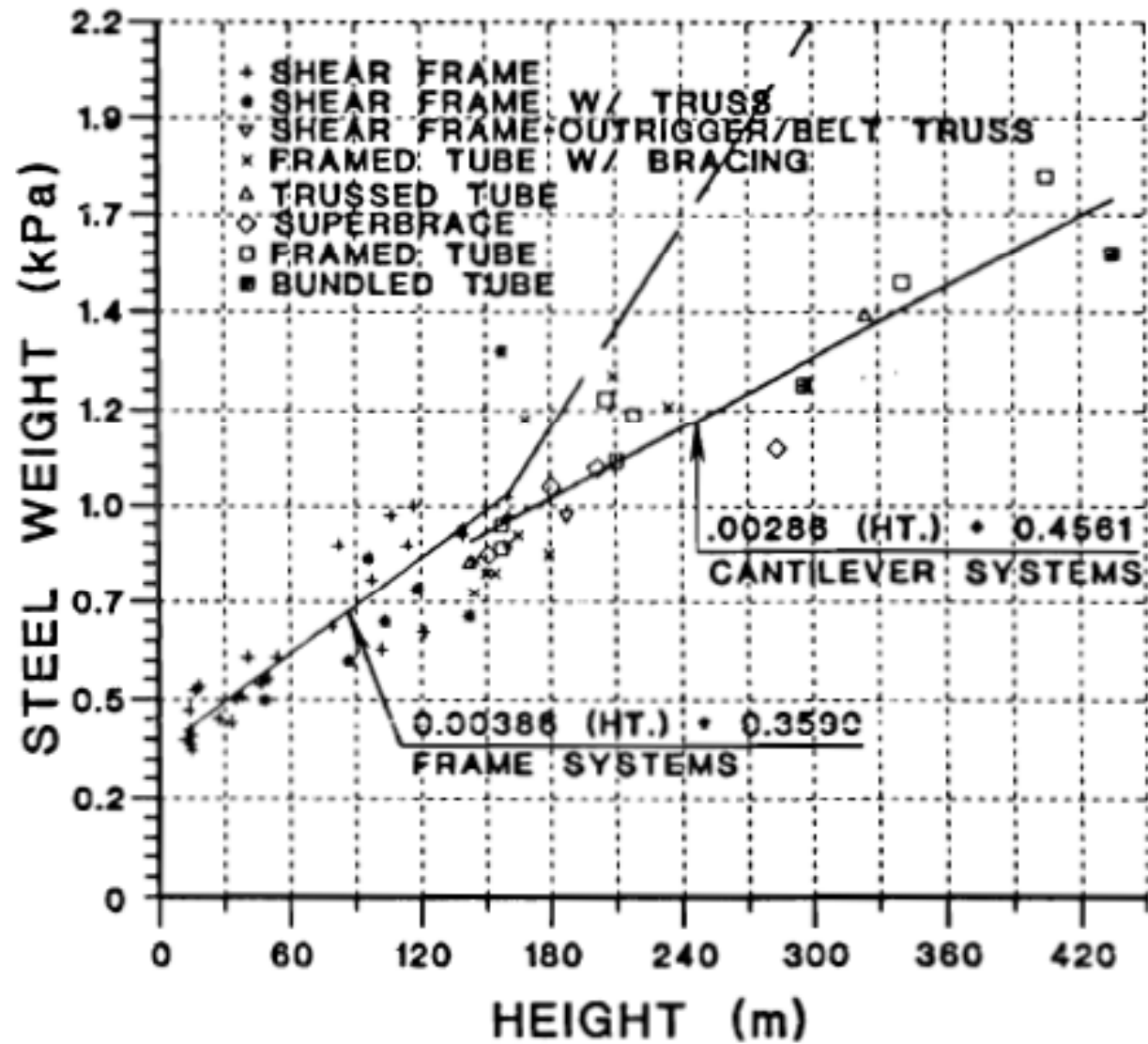


Fig. 5. All steel systems — structural steel quantities versus height.

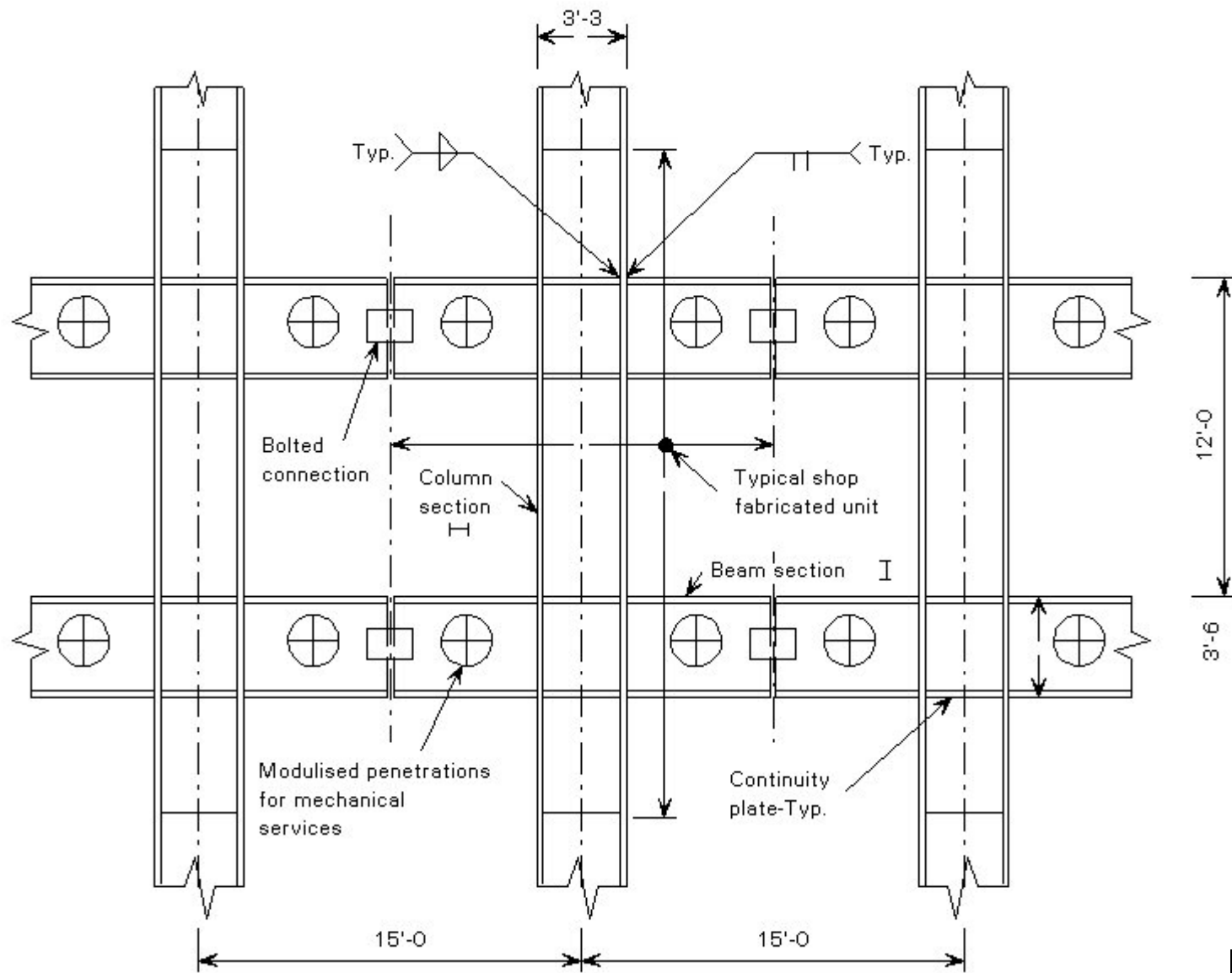


Figure 7 Tree fabrication unit