General presentation of Eurocode 4

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durables

EUROCODE 4 :
Design of composite steel and concrete structures

EN 1994-1-1 : general rules and rules for buildings
EN 1994-1-2 : structural fire design
EN 1994-2 : general rules and rules for bridges

The general rules valid for bridges from part 1-1 are repeated in part 2 to get a self sufficient document.

EN 1994-1-1

Forward		
Section 1	**General**	*Common to all EC* (Sections 1–2)
Section 2	**Basis of design**	
Section 3	**Material**	*Layout common to all EC* (Sections 3–7)
Section 4	**Durability**	
Section 5	**Structural analysis**	
Section 6	**ULS**	
Section 7	**SLS**	
Section 8	**Composite joints in frames for** buildings	
Section 9	**Composite slabs for** buildings	
Annex A	**(informative) Stiffness of joint in** buildings	
Annex B	**(informative) Standard tests**	
Annex C	**(informative) Shrinkage of concrete for** buildings	

EN 1994-2

Forward	
Section 1	General
Section 2	Basis of design
Section 3	Material
Section 4	Durability
Section 5	Structural analysis
Section 6	ULS
Section 7	SLS
Section 8	Precast concrete slabs in bridges
Section 9	Composite plates in bridges
Annex C	Headed studs that cause splitting in the slab thickness

The paragraphs specific to buildings are put at the end to be easily modified.

EN 1994-1-1

6.4 Lateral-torsional buckling of composite beams

6.4.1 General

(1) A steel flange that is attached to a concrete or composite slab by shear connection in accordance with 6.6 may be assumed to be laterally stable, provided that lateral instability of the concrete slab is prevented.

(2) All other steel flanges in compression should be checked for lateral stability.

(3) The methods in EN 1993-1-1, 6.3.2.1-6.3.2.3 and, more generally, 6.3.4 are applicable to the steel section on the basis of the cross-sectional forces on the composite section, taking into account effects of sequence of construction in accordance with 5.4.2.4. The lateral and elastic torsional restraint at the level of the shear connection to the concrete slab may be taken into account.

(4) For composite beams in buildings with cross-sections in Class 1, 2 or 3 and of uniform structural steel section, the method given in 6.4.2 may be used.

6.4.2 Verification of lateral-torsional buckling of continuous composite beams with cross-sections in Class 1, 2 and 3 for buildings

Rules for drafting

The paragraphs specific to bridges are added at the end of the clauses.

EN 1994-2

6.4 Lateral-torsional buckling of composite beams

6.4.1 General

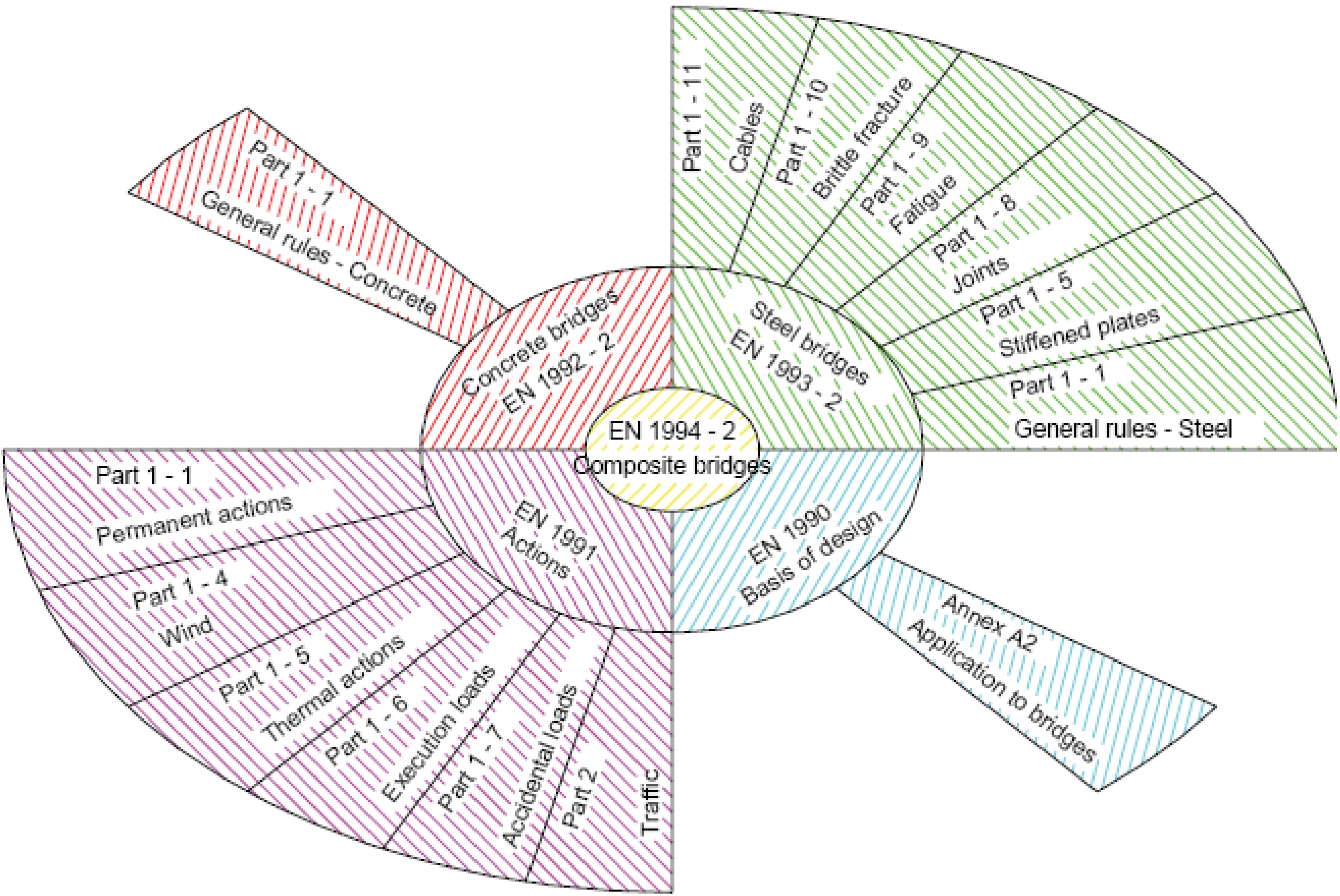
(1) A steel flange that is attached to a concrete or composite slab by shear connection in accordance with 6.6 may be assumed to be laterally stable, provided that lateral instability of the concrete slab is prevented.

(2) All other steel flanges in compression should be checked for lateral stability.

(3) The methods in EN 1993-1-1: 2005, 6.3.2.1-6.3.2.3 and, more generally, 6.3.4 are applicable to the steel section on the basis of the cross-sectional forces on the composite section, taking into account effects of sequence of construction in accordance with 5.4.2.4. The lateral and elastic torsional restraint at the level of the shear connection to the concrete slab may be taken into account.

6.4.2 Beams in bridges with uniform cross-sections in Class 1, 2 or 3

Avoid cascades of references



Scope of EN 1994-1-1

Composite members

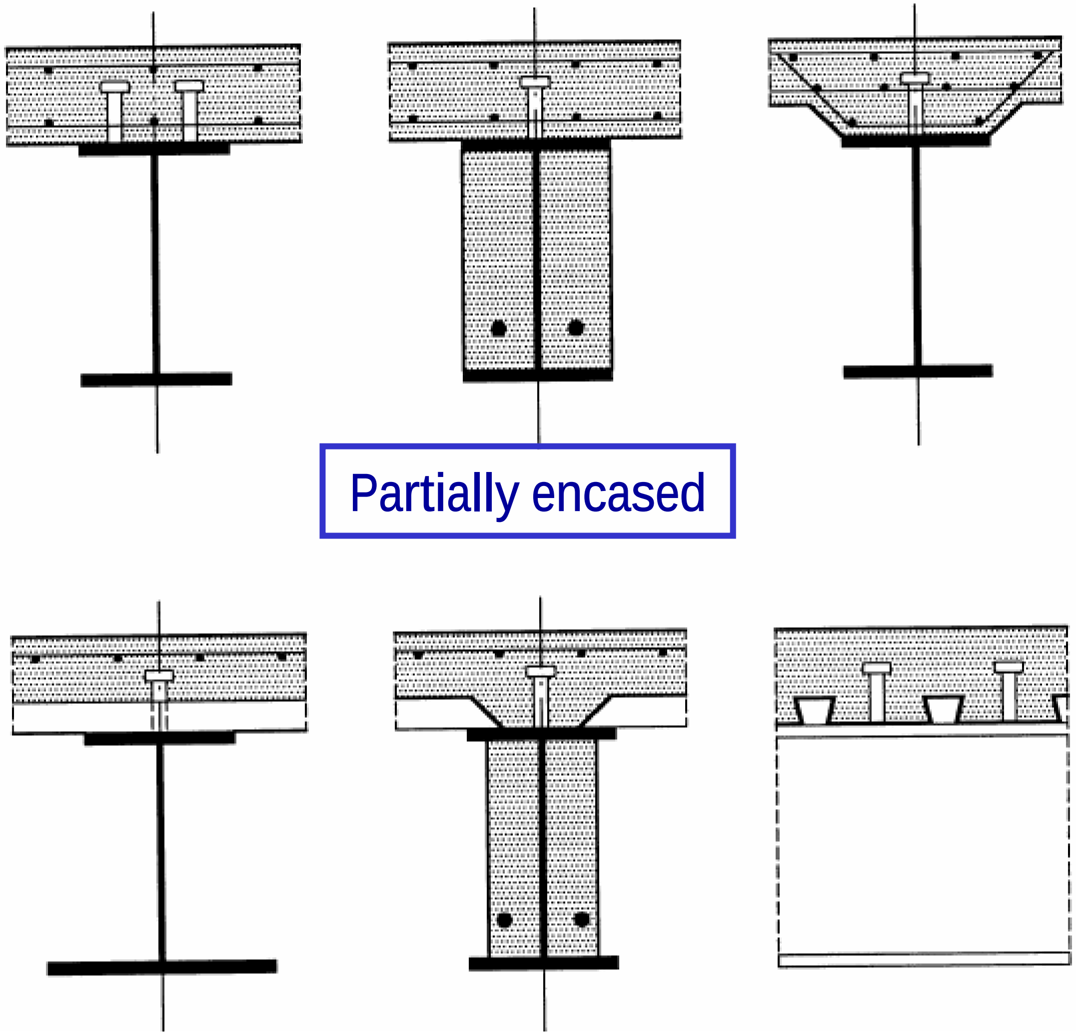
Composite beams
Composite columns

Composite slabs

Composite joints

Composite beams

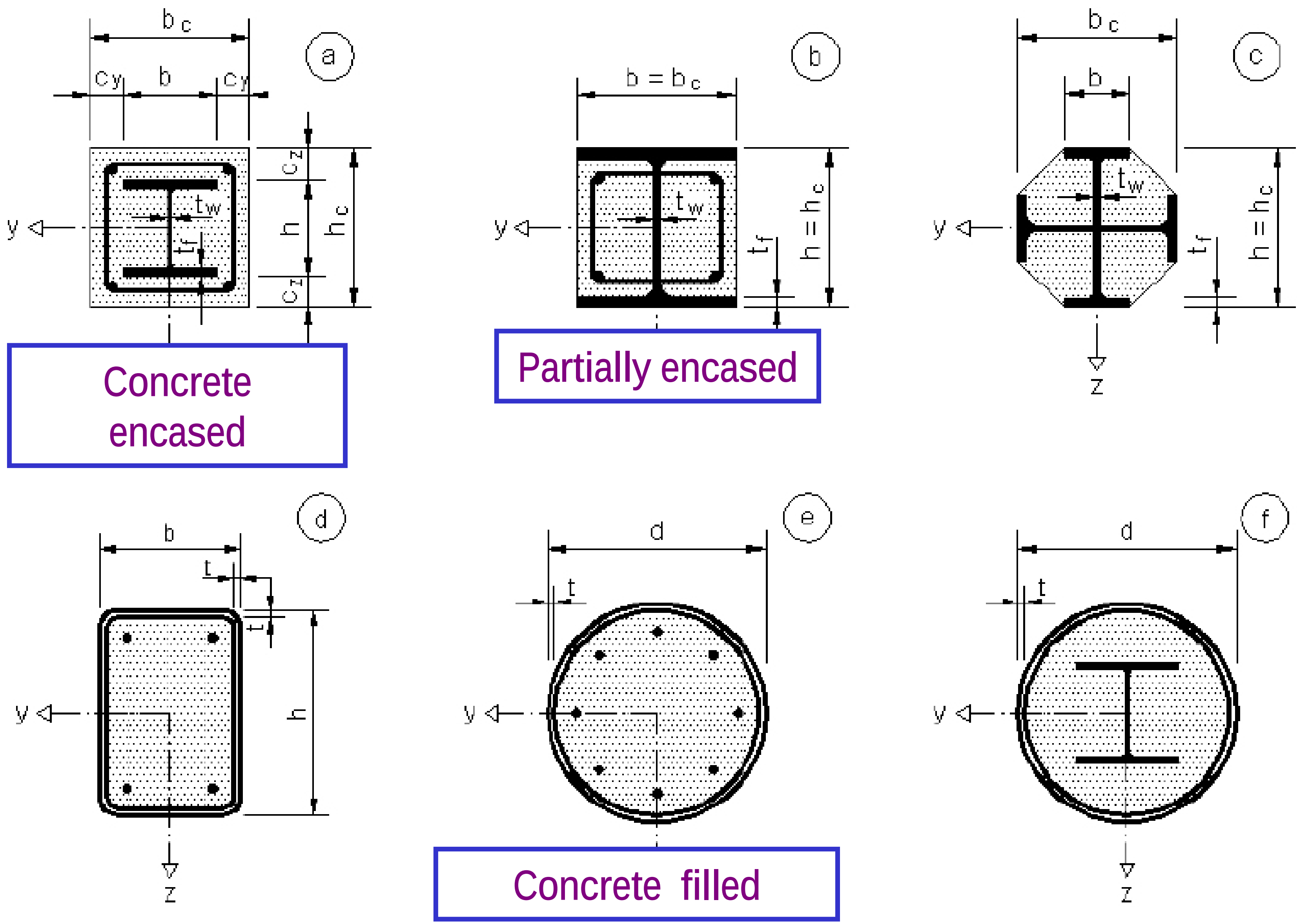
Solid slab



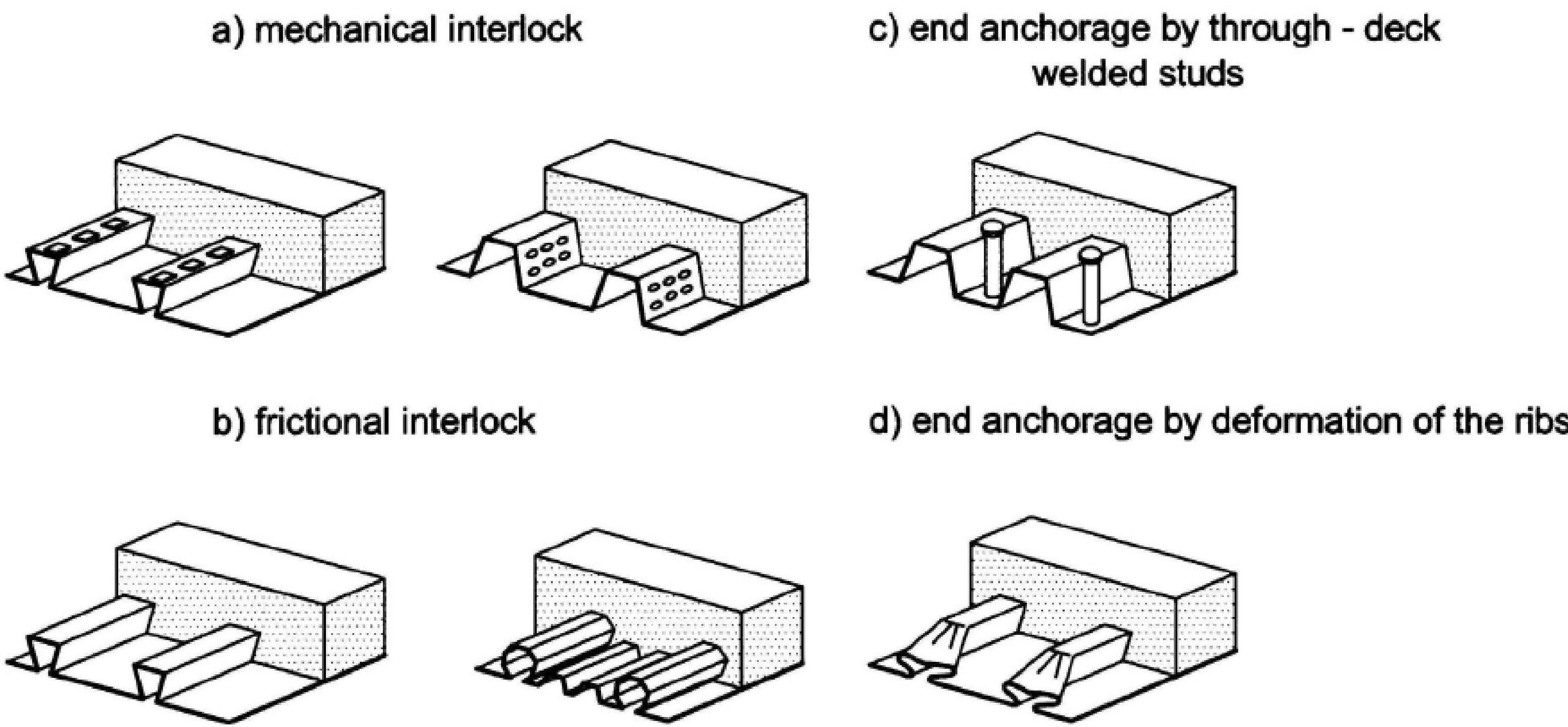
Partially encased

Composite slab

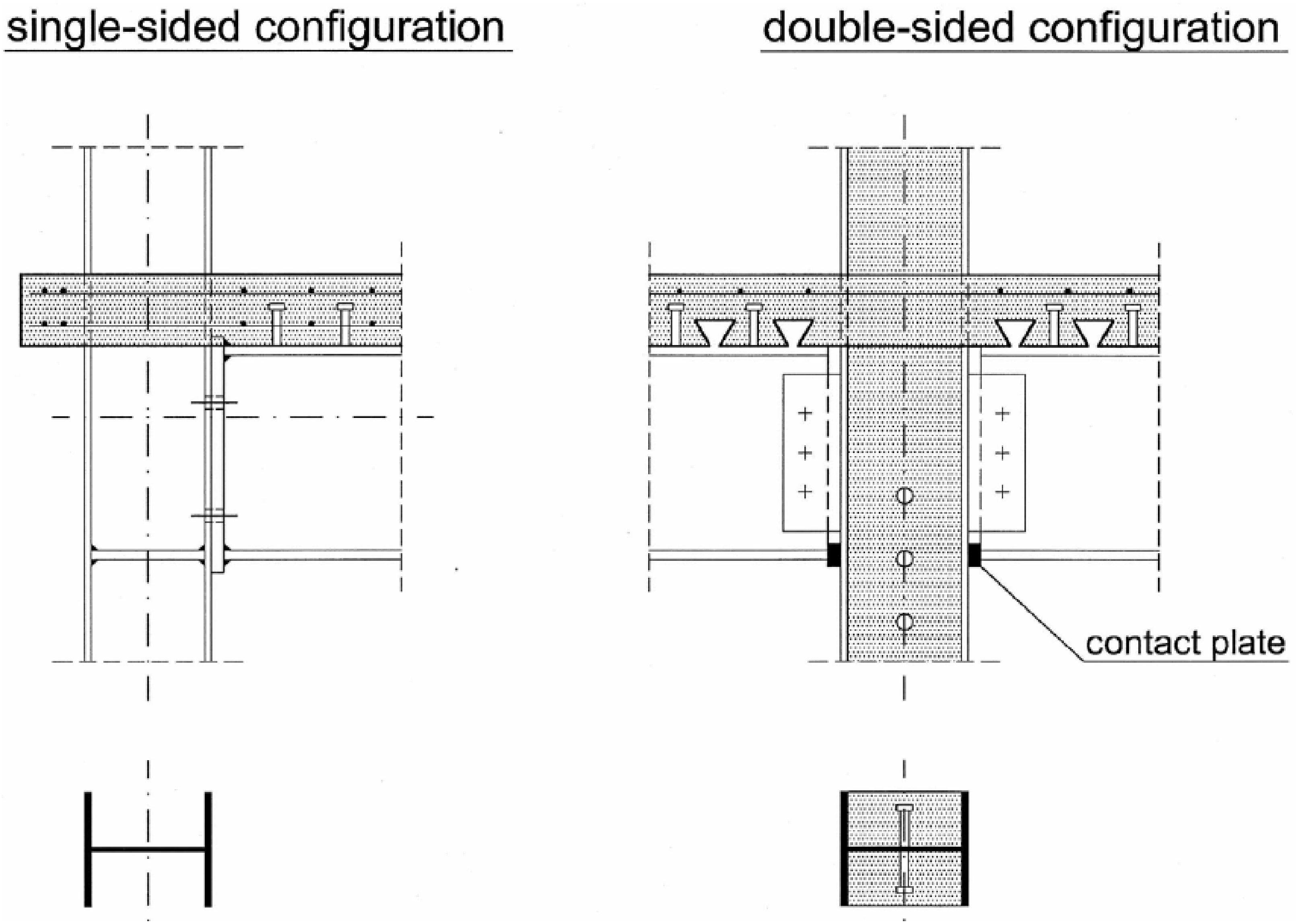
Composite columns



Composite slabs



Composite joints



Scope of EN 1994-2

Composite bridges

- I girders
- Box sections
- Cable stayed bridges not fully covered

Composite members

Filler beam decks

Tension members

Composite plates

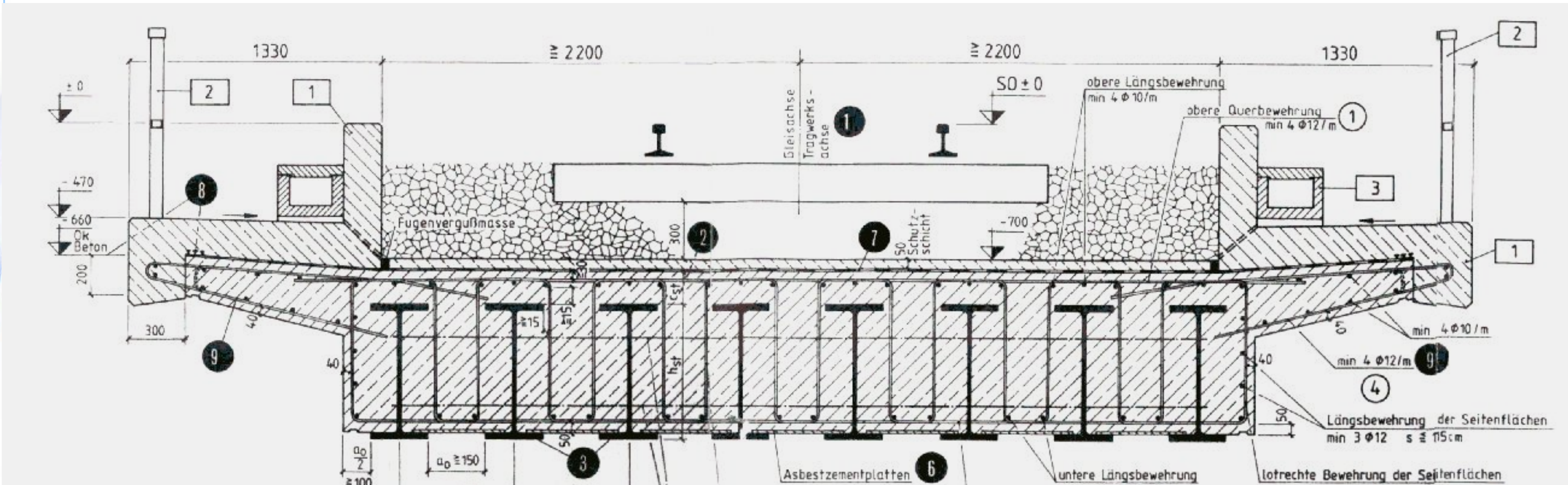
Composite bridges

Composite members

Filler beam decks

transversal

longitudinal



Tension members

Composite plates

Coordination EC4-EC3 : materials

	EC4	EC3
Grade of steel	S 235 – S 460	S 235 – S 460 + EN 1993-1-12 (S 690)
Coefficient of expansion	$10\ 10^{-6}$ equal for steel and concrete	$12\ 10^{-6}$

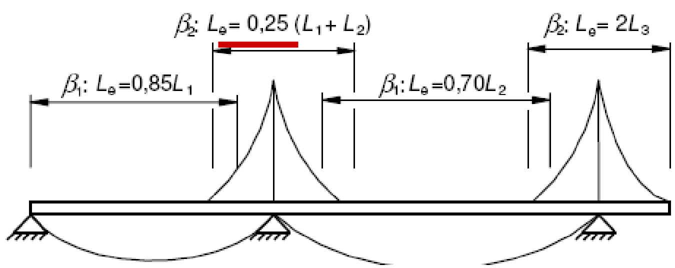
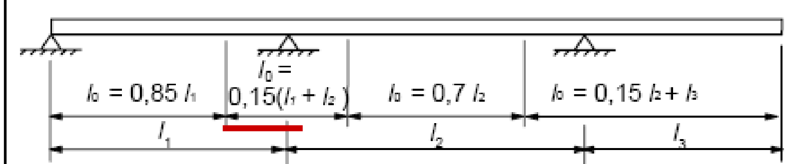
Coordination EC4-EC2 : materials

	EC4	EC2
Concrete strength	C20 – C60	C12 – C90
shrinkage	As in EC2 or annex C (3,25x10^{-4} in dry environment)	
Modulus of elasticity	210 000 (as in EC3) equal for steel and reinforcement	200 000

Coordination EC4-EC3 : design rules

	EC4	EC3
Effective width	Slab : EC4 (same at SLS/ULS) steel flange : EN 1993-1-5	EN 1993-1-5 (SLS $\neq$ ULS)

Coordination EC4-EC2 : design rules

	EC4	EC2
Design value	$f_{cd} = f_{ck} / \gamma_C$ 0.85 is a calibration factor of $M_{pl,Rd}$	$f_{cd} = \alpha_{cc} f_{ck} / \gamma_C$
Effective width		
Shear	Vertical shear resistance of the cracked slab in EC2 has been modified	