Annex for Switzerland

Steel Design 1

Structural basics

Stahlbau Zentrum Schweiz
Centre suisse de la construction métallique
Centro svizzero per la costruzione in acciaio

Colofon / Content

Annex for Switzerland to *Structural basics* (Steel Design 1)

This annex has been prepared by Dr. Roland Bärtschi and Myriam Spinnler and is based on the English translation of *Structural basics*, published in 2019 by Bouwen met Staal. The original Dutch version was published in 2011 (and updated in 2012) by Bouwen met Staal as *Krachtswerking*. References are made to each NA symbol in *Structural basics* and the corresponding clause in the Eurocode.
Annexes to *Structural basics* (Steel Design 1) are also available for Belgium, Germany, Luxembourg and Switzerland and can be downloaded free of charge from the website of SZS Stahlbau Zentrum Schweiz.

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Eurocodes in Switzerland

Switzerland is an EFTA but not an EC member despite its central geographical location in Europe. Still, Switzerland is obliged just as well as every other European country to retract any codes and standards contradictive to European regulations.

Switzerland has a long tradition of national codes, starting with the first code named "*Verordnung betreffend Berechnung und Prüfung der eisernen Brücken- und Dachkonstruktionen auf den schweizerischen Eisenbahnen*" in 1892. Since then, a comprehensive set of national codes has been elaborated, whereas the 2013 revision is the latest state of the national structural codes. In 2011, a comprehensive set of national codes on existing structures named SIA 269 has been published as a world's first.

Still, Switzerland has been very close to the elaboration of European codes and is very active in the European code committees from their first days. As a result, the Swiss national codes published by SIA, the Swiss Society of Engineers and Architects, are non-contradictive to Eurocode since 2003 when the first codes of the 260 series were published. The Swiss national codes are compact, well-condensed versions of the European codes, well-adapted to Swiss legal and practice boundary conditions.

Eurocodes are also used in countries where the degree of regulation must be much higher. This leads to very large documents which makes the vast extent of the Eurocode regulations a constant matter of discussion among the European countries.

In Switzerland, on the other hand, codes are not mandatory rules to be strictly obeyed but – at least from a legal perspective – more of a recommendation assumed to possibly reflect the state of the art. Therefore, Swiss standards do not need to cover every detail, but leave a lot of freedom and responsibility to the engineer. This allows for much shorter codes limited to a few principles, whereas one of the most important paragraphs is the "Exception Article" which basically says: "If you know better, do better". As such, Swiss codes are a non-contradictory, slim version of the Eurocodes.

In addition to the Swiss codes, Switzerland maintains national annexes to most European codes.

The present book "Structural Basics" explains the fundamentals of steel design based on the Eurocodes. The Eurocodes allow for national regulations in some special cases and contain numerous "Nationally Determined Parameters" (NDPs), which must be defined in each country. The present annex thus is related to the Swiss national annexes and gives reference to the Swiss codes.

Annex CH1

Structural safety

p. 1-7 **EN 1993-1-1, cl. 6.1(1)**

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0}=\gamma_{M1}=1{,}05$;
$\gamma_{M2}=1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} and γ_{M1}.

p. 1-10 (a + b) **EN 1990, cl. A1.2.2, table A1.1**

The Swiss national annex gives different ψ factors for snow and wind and it gives additional ψ factors for actions from the subsoil, see table CH1.1.

action	Ψ_0	Ψ_1	Ψ_2
imposed loads in buildings:			
– cat. A: domestic, residential areas	0,7	0,5	0,3
– cat. B: office areas	0,7	0,5	0,3
– cat. C: congregation areas	0,7	0,7	0,6
– cat. D: shopping areas	0,7	0,7	0,6
– cat. E: storage areas	1,0	0,9	0,8
– cat. F: traffic area, vehicle weight ≤ 30kN	0,7	0,7	0,6
– cat. G: traffic area, – 30kN < vehicle weight ≤ 160kN	0,7	0,5	0,3
– cat. H: roofs	0	0	0
temperature (non-fire) in buildings	0,6	0,5	0
snow loads	$1–60/h_0$	$1–250/h_0$	$1–1000/h_0$
wind loads	0,6	0,5	0
actions from the subsoil:			
– earth pressure	0,7	0,7	0,7
– water pressure	0,7	0,7	0,7

Table CH1.1: Values of ψ factors for variable actions

p. 1-11 (a + b) EN 1990, cl. 6.4.3.2 & cl. A1.3.1 (tables A1.2(A), (B) & (C))

Only equation (1.8) is to be used. This equals equation (6.10) of EN 1990. This regulation is in accordance with the formula (16) of standard SIA 260:2013. Therefore, the factor ξ is irrelevant for use in Switzerland and equations (1.9), (1.10), (1.12) an (1.13) are not to be considered.
Tables A1.2(A), (B) and (C) contain the partial safety factors $\gamma_{G,j}$, $\gamma_{Q,1}$ and $\gamma_{Q,i}$ for the design values of actions. These partial safety factors are defined as NDPs in the national annex to EN 1990.
In accordance with standard SIA 260, no factor is applied to the accompanying action in all limit states: $\gamma_{Q,i} = 1{,}00$; the characteristic value of an accompanying action is thus multiplied only by the associated reduction factor (combination factor) $\Psi_{0,i}$.

Using only equation (1.8) and the given tables in the Swiss national annex, this leads to the following equations, which replace equation (1.11) given in the book:

Table A1.2(A) contains the partial safety factors for type 1 limit states in accordance with cl. 4.4.3.1 of standard SIA 260:2013. The procedure according to NOTE 2 is not allowed.
Formula (1.8) is used for the verification of the overall stability of a structure (type 1 limit state) under unfavourable permanent action:

$$1{,}10\ G + 1{,}50\ Q_{k,1} + \sum_{i>1} \psi_{0,i} Q_{k,i}$$

In case of favourable permanent action:

$$0{,}90\ G + 1{,}50\ Q_{k,1} + \sum_{i>1} \psi_{0,i} Q_{k,i}$$

Table A1.2(B) contains the partial safety factors for type 2 limit states in accordance with cl. 4.4.3.1 of standard SIA 260:2013.
Formula (1.8) is used for the design of the structural integrity of the structure or one of its components (type 2 limit state) under unfavourable permanent action:

$$1{,}35\ G + 1{,}50\ Q_{k,1} + \sum_{i>1} \psi_{0,i} Q_{k,i}$$

In case of favourable permanent action:

$$0{,}80\ G + 1{,}50\ Q_{k,1} + \sum_{i>1} \psi_{0,i} Q_{k,i}$$

Table A1.2(C) contains the partial safety factors for type 3 limit states in accordance with cl. 4.4.3.1 of standard SIA 260:2013. Reference is also made to cl. 8.5.2.4 and 12.5.2.4 in standard SIA 267:2013.
Formula (1.8) is used to verify the load-bearing resistance of the subsoil (type 3 limit state) under favourable or unfavourable permanent action:

$$1{,}00\ G + 1{,}30\ Q_{k,1} + \sum_{i>1} \psi_{0,i} Q_{k,i}$$

p. 1-11 (c) EN 1990, cl. 6.4.3.3 & cl. A1.3.2 (table A1.3)

In the case of exceptional design situations - with the exception of the exceptional design situation of impact - any prevailing accompanying effect with its quasi-static value must be taken into account. In this case, no further accompanying effects are taken into account.

For accidental design situations, cl. 4.4.3.5 equation (17) of standard SIA 260:2013 generally applies:

$$E_d = E\{G_k, P_k, A_d, \psi_{2i} Q_{ki}, X_d, a_d\}$$

In the event of an accidental design situation of impact, the one prevailing accompanying effect, if any, with its frequent value, shall be taken into account. Cl. 4.4.3.6 of standard SIA 260:2013 applies to the accidental design situation of impact.

p. 1-12 EN 1990, cl. A1.4.1

Unless otherwise specified in EN 1991 to EN 1999, the partial safety factors should be set 1,0 for the serviceability limit state.

p. 1-14 (a + b) EN 1990, cl. B3.1(1), table B1

The definition of consequence classes is used in Switzerland without any modification.

p. 1-15 (a) EN 1990, cl. 6.4.3.2 & cl. A1.3.1 (tables A1.2(A), (B) & (C))

According to the explanation in point p. 1-11 (a + b) equations (1.23), (1.24), (1.26) and (1.27) are not relevant for use in Switzerland. With the partial safety factors given in tables A1.2(B) for type 2 limit state (attainment of load-bearing resistance) and unfavourable permanent action, equations (1.22) and (1.25) turn into:

$$1{,}1 \cdot \left(1{,}35G + 1{,}5Q_{k1} + \sum_{i>1} \psi_{0i} Q_{ki}\right) = 1{,}5G + 1{,}65Q_{k1} + \sum_{i>1} 1{,}1 \cdot \psi_{0i} Q_{ki} \qquad (1.22)$$

$$0{,}9 \cdot \left(1{,}35G + 1{,}5Q_{k1} + \sum_{i>1} \psi_{0i} Q_{ki}\right) = 1{,}2G + 1{,}35Q_{k1} + \sum_{i>1} 0{,}9 \cdot \psi_{0i} Q_{ki} \qquad (1.25)$$

p. 1-15 (b) Assessment of existing buildings

For existing structures, SIA 269:2011 applies. SIA 269/1 defines rules for updating actions to structures. For the assessment of existing steel structures SIA 269/3:2011 applies. A complete overview on the Swiss National Codes on existing structures is given in table CH1.2.

Number	Name
SIA 269:2011	Existing structures - Bases
SIA 269/1:2011	Existing Structures – Actions
SIA 269/2:2011	Existing Structures – Concrete structures
SIA 269/3:2011	Existing Structures – Steel structures
SIA 269/4:2011	Existing Structures – Composite steel and concrete structures
SIA 269/5:2011	Existing Structures – Timber structures
SIA 269/6-1:2011	Existing Structures – Stone masonry, part 1: natural stone masonry
SIA 269/6-2:2014	Existing Structures – Stone masonry, part 2: artificial stone masonry
SIA 269/7:2011	Existing Structures – Geotechnics
SIA 269/8:2017	Existing Structures – Earthquake

Table CH1.2: Swiss National Codes on existing structures

p. 1-17 EN 1990, cl. 2.3, table 2.1

Table 2.1 of EN 1990 (= table 1.13 in book) applies, without the design working life class 3, see table CH1.3.

category	Design working life (years)	examples
1	10	temporary structures [a]
2	10-25	replaceable structural parts, e.g. gantry girders, bearings
4	50	building structures and other common structures
5	100	monumental building structures, bridges and other civil engineering works

[a] NOTE: Structures or parts of structures that can be dismantled with a view to being re-used should not be considered as temporary.

Table CH1.3: Design working life for buildings

p. 1-22 EN 1990, cl. A1.4.2(2)

The Swiss national annex to EN 1990 specifies the serviceability criteria. The specified guide values for the deflection of slabs and beams, the horizontal displacement of walls, frames and columns, the natural frequencies of buildings and the deflections and displacements of crane girders and columns are in conformity with the indications in tables 3 to 5 and 16 of standard SIA 260:2013.

Deviating limit values for deflections and horizontal displacements can be agreed in accordance with the requirements of use and must be specified in the project basis.

Annex CH 2

Actions and deformations

p. 2-6 **EN 1993-1-1, cl. 6.1(1)**

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0} = \gamma_{M1} = 1{,}05$;
$\gamma_{M2} = 1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} and γ_{M1}.

p. 2-8 (a, b + c) + p. 2-9 **EN 1990, cl. A1.3.1 (tables A1.2(B) & (C)) & cl. 6.4.3.2(3)**

Only equation (1.8) of EN 1990 is to be used. This equals equation (1.8) of Structural basics, chapter 1, section 1.4.3. This regulation is in accordance with the formula (16) of standard SIA 260:2013. Therefore, the factor ξ is irrelevant for use in Switzerland and equations (1.9) and (1.10) are not to be considered.
Tables A1.2(A), (B) and (C) contain the partial safety factors $\gamma_{G,j}$, $\gamma_{Q,1}$ and $\gamma_{Q,i}$ for the design values of actions. These partial safety factors are defined as NDPs in the national annex to EN 1990.
Using the given values in the Swiss national annex, table 6.2 can be modified to table CH2.1.
See also national annex for Switzerland, chapter 1, p. 1-11(a+b) and p. 1-11(c).

p. 2-10 **EN 1990, cl. 2.3, table 2.1 & cl. A1.1(1)**

Table 2.1 of EN 1990 (= table 2.7 in book) applies, without the design working life class 3. See also national annex for Switzerland, chapter 1, p. 1-17.

p. 2-14 (a) **EN 1991-1-1, cl. 6.3.1.2(10)**

The reduction factor α_A for area may not be applied.

p. 2-14 (b) **EN 1991-1-1, cl. 6.3.1.2(11)**

The reduction factor α_n is applicable in Switzerland. The Swiss national annex gives the following definition:
In multi-storey buildings with imposed loads as main action, the characteristic values are to be used for two storeys per storey group with usable areas of the same category,

for the others the values reduced with the reduction coefficients ψ_1 according to NA CH EN 1990.

The reduction coefficient is defined as:

$$\propto_n = \frac{2 + (n-2) \cdot \psi_1}{n}$$

n	Number of storeys (n > 1) above the element under consideration with the same category of use.
ψ_1	Coefficient for building use EN 1990

This provision is adopted from standard SIA 261.

limit state	design situation or combination of actions			γ_G		γ_{Q1}	γ_{Qi}**	γ_A
				unfavourable	favourable			
ultimate limit state EQU (set A)	persistent or transient design situation (fundamental combinations)			1,1	0,9	1,5	1,0	-
ultimate limit state STR/GEO (set B)	persistent or transient design situation (fundamental combinations)	RC3	eq. (1.8)*	1,5	0,8	1,65	1,0	-
		RC2	eq. (1.8)*	1,35	0,8	1,5	1,0	-
		RC1	eq. (1.8)*	1,2	0,8	1,35	1,0	-
ultimate limit state STR/GEO (set C)	persistent or transient design situation (fundamental combinations)			1,0	1,0	1,3	1,0	-
ultimate limit state	accidental design situation			1,0	1,0	1,0	1,0	1,0
ultimate limit state	seismic design situation			1,0	1,0	1,0	1,0	1,0
Serviceability limit state	characteristic, frequent, quasi-permanent combinations			1,0	1,0	1,0	1,0	

*) See *Structural basics*, chapter 1, section 1.4.3.

**) In accordance with standard SIA 260, no factor is applied to the accompanying action in all limit states: $\gamma_{Q,i} = 1{,}00$; the characteristic value of an accompanying action is thus multiplied only by the associated reduction factor (combination factor) Ψ. This is for persistent or transient design situations $\Psi_{0,i}$, for accidental and seismic design situations (if any prevailing accompanying effect must be taken into account) Ψ_{21}, for accidental design situations of impact Ψ_{11}. For the serviceability limit state Ψ is depending on the governing combination (characteristic, frequent, quasi-permanent).

Table CH2.1: Partial factors for actions for several limit states and design situations

category of use	description	q_k (kN/m^2)	Q_k (kN)
A	areas for domestic and residential activities		
	– floors	2,0	2,0
	– stairs	4,0	2,0
	– balconies	3,0	2,0
B	office areas	3,0	2,0
C	areas where people may concregate		
C1	– tables	3,0	4,0
C2	– fixed seats	4,0	4,0
C3	– large crowds, physical activities, without obstacles for moving people	5,0	4,0
D	shopping areas	5,0	4,0
E	areas for accumulation of goods or industrial use	*	*
	garages and vehicle traffic areas		
F	– light vehicles, lighter than 35 kN	2,0	20
G	– medium weight vehicles: 35 kN to 160 kN	3,0	90
H	roofs	0,4	1,0

Table CH2.2: Imposed loads

Switzerland	Ψ_0	Ψ_1	Ψ_2
	$1-60/h_0$	$1-250/h_0$	$1-1000/h_0$

Table CH2.3: Values of ψ factors for snow loads

p. 2-14 (c) EN 1991-1-1, cl. 6.3.1.2(11)

Characteristic values for uniformly distributed load q_k and concentrated loads Q_k per category of use are specified in the Swiss national annex. A (not complete) summary is shown in table CH2.2.

The characteristic loads lie within the range given by EN 1991-1-1.

p. 2-16 (a) EN 1991-1-3, cl. 4.1, 4.2(1) & 5.2

The characteristic value for snow load on the ground s_k is

$$s_k = \left[1+\left(\frac{h_0}{350}\right)^2\right]\cdot 0{,}4\ kN/m^2 \geq 0{,}9\ kN/m^2$$

The location-dependent reference height h_0 corresponds to the altitude of the structure in m, which has to be calibrated according to SIA 261, Annex D.
This provision is in accordance with SIA 261, cl. 5.2.6.

The coefficients ψ_0, ψ_1, ψ_2 according to the national annex to EN 1990 are given in table CH2.3.

The recommended values for C_e are adopted.
Unless detailed investigations permit a reduction, C_t = 1,0.

p. 2-16 (b) EN 1991-1-3, cl. 4.3

The provisions on exceptional snow loads do not apply.

p. 2-16 (c) EN 1991-1-3, cl. 5.3 & 6.2

The provisions on load arrangement in accordance with Annex B of EN 1991-1-3 shall not apply.
Snow loads must always be treated as stationary, variable loads. There is no corresponding provision in SIA 261 or SIA 261/1.

p. 2-17 EN 1991-1-4, cl. 4.2(1)

The provision of EN 1991-1-4:2005 applies and is in accordance with the SIA documentation D 0188, cl. 5.1.

p. 2-18 EN 1991-1-4, cl. 4.2(2)

The recommended values of c_{dir} = 1,0 and c_{season} = 1,0 are adopted.
There are no corresponding factors in standard SIA 261:2014.

p. 2-19 (a) EN 1991-1-4, cl. 4.3.2

The roughness factor $c_r(z)$ is replaced by the profile factor c_h in standard SIA 261:2014, cl. 6.2.1.6.
The profile factor c_h is applied to q_{p0} with a potential approach. In Switzerland, only mixed profiles and no pure profiles are existing due to the topography. For further explanations, please refer to the SIA documentation D 0188. The profile factor c_h is determined in accordance with standard SIA 261:2014, cl. 6.2.1.2.

p. 2-19 (b) EN 1991-1-4, cl. 4.3.3

The procedure to determine $c_0(z)$ according to EN 1991-1-4, Annex A.3 is confirmed.
The orography factor $c_0(z)$ is considered in the basic velocity (standard SIA 261:2014, wind map Annex E) with $c_0(z)$ = 1,0.

p. 2-19 (c) EN 1991-1-4, cl. 4.5

The peak velocity pressure $q_p(z)$ is to be calculated according to standard SIA 261:2014, cl. 6.2.1.1 as follows

$$q_p(z) = c_h \cdot q_{p0}$$

where the profile factor c_h is determined in accordance with standard SIA 261:2014, cl. 6.2.1.2 and the dynamic pressure q_{p0} is determined from the wind map of the standard SIA 261:2014, Annex E.

p. 2-19 (d) EN 1991-1-4, cl. 4.4

The turbulence intensity $I_v(z)$ is replaced by the peak factor $c_{pic}(z)$ with reference to the SIA documentation D 0188, cl. A1-1.3.
The turbulence intensity $I_v(z)$ is covered by the peak factor $c_{pic}(z)$, which is defined as a function of roughness and building height (see SIA documentation D 0188, cl. A1-1.3).

p. 2-19 (e) EN 1991-1-4, cl. 4.5

The recommended value for air density is ρ = 1,2 kg/m^3.

If more precise values are required for air density, it can be determined as a function of temperature and altitude above sea level.

p. 2-21 EN 1991-1-4, cl. 7.2.2

The provisions of EN 1991-1-4, cl. 7.2.2 apply.
In principle, the simplified procedure according to EN 1991-1-4:2005 can be adopted. In comparison to the application of the rules in standard SIA 261:2014, these are generally conservative, especially in cases where the ratios of the building dimensions are not being considered.

p. 2-22 EN 1991-1-4, cl. 5.3(5) & 7.2.2(3)

The recommendations of EN 1991-1-4 apply.

p. 2-26 EN 1991-1-4, cl. 6.3.1

The structural factor $c_s{\cdot}c_d$ is replaced by $c_{red}{\cdot}c_d$ according to standard SIA 261:2014, cl. 6.3 and the SIA documentation D 0188, Annex A1.
The values c_d and c_{red} have been decoupled in standard SIA 261, cl. 6.3 and SIA documentation D 0188, Annex A1, enabling the c_{red} reduction factor to be used for static problems as well.
The reduction factor c_{red} is calculated with reference to the SIA documentation D 0188, cl. 6.7. The dynamic factor c_d shall be determined in accordance with cl. 6.9 of the SIA documentation D 0188.
The methods in Annex B and Annex C of EN 1991-1-4:2005 are based on the structural factor $c_s{\cdot}c_d$.

p. 2-29 (a) EN 1991-1-3, cl. 7

The Swiss national annex to EN 1991-1-3 contains no information concerning the consideration of ponding or water accumulation.

p. 2-29 (b) EN 1990, cl. A1.4.2(2)

The Swiss national annex to EN 1990 specifies the serviceability criteria. The specified guide values for the deflection of slabs and beams, the horizontal displacement of walls, frames and columns, the natural frequencies of buildings and the deflections and displacements of crane girders and columns are in conformity with the indications in Tables 3 to 5 and 16 of standard SIA 260:2013.
Deviating limit values for deflections and horizontal displacements can be agreed in accordance with the requirements of use and must be specified in the project basis.

p. 2-30 EN 1990, cl. A1.4.4

As mentioned above in p. 2-29 (b), the requirements for natural frequency are given in the Swiss national annex to EN 1990 and in the standard SIA 260:2013, table 5.

p. 2-30 **EN 1991-1-1, Annex A & B**

Annexes A and B are informative.

p. 2-33 (a) **EN 1991-1-3, cl. 2(3)**

Snowfall is not to be treated as exceptional condition.

Snow loads must always be treated as stationary, variable loads. There is no corresponding provision in SIA 261 or SIA 261/1.

p. 2-33 (b) **EN 1991-1-3, cl. 4.1 & 4.2**

See remarks to p. 2-16 (a).

p. 2-33 (c) **EN 1991-1-3, cl. 4.3**

Snowfall is not to be treated as exceptional condition. Thus, exceptional snow loads on the ground are not relevant.

Snow loads must always be treated as stationary, variable loads. There is no corresponding provision in SIA 261 or SIA 261/1.

p. 2-34 (a) **EN 1991-1-3, cl. 6.2 & 6.3**

Annex B shall not be used to determine the load of snow drifted.

Overhanging snow at the edge of a roof must be taken into account for sites above 800 m above sea level.

This provision is in accordance with standard SIA 261, cl. 5.3.7.

p. 2-34 (b) **EN 1991-1-3, cl. 7**

The Swiss national annex to EN 1991-1-3 contains no information concerning the consideration of ponding or water accumulation.

p. 2-34 (c) **EN 1991-1-3, Annexes**

Snow loads must always be treated as stationary, variable loads. Thus, cases B1, B2 and B3 of Annex A do not apply.

Annexes B and C should not be applied.

Annex D may be used. Standard SIA 261 allows alternative definitions of the characteristic value of the snow load.

Annex E may be used and is in accordance with standard SIA 261, cl. 5.3.7.

p. 2-34 (d) **EN 1991-1-4, cl. 1.5(2)**

Loads, system responses and terrain parameters can also be determined by original measurements. This provision is in accordance with the information provided in the SIA documentation D 0188, cl. 5.1.

p. 2-35 **EN 1991-1-4, cl. 4.2, 4.3, 4.4 & 4.5**

See remarks to p. 2-17, p. 2-18 and p. 2-19 (a) through to (e).

p. 2-37 **EN 1991-1-4, Annexes**

Annex A is informative. The provision of cl. A.2(1) is adopted while the structural factor $c_s \cdot c_d$ is replaced by $c_{red} \cdot c_d$ according to standard SIA 261:2014, cl. 6.3 and the SIA documentation D 0188, Annex A1.
Annexes B, C and D are informative.
Annex E is informative and procedure 1 for calculating the transverse vibration amplitude is adopted from cl. E.1.5.2. The application of procedure 1 is in accordance with the SIA documentation D 0188. A calculation procedure for the calculation of forces transverse to the wind direction due to vortex formation is explained in the SIA documentation D 0188, cl. 7.
Annex F is informative.

p. 2-44 **EN 1991-1-4, cl. 4.5**

See remarks to p. 2-19 (c).

p. 2-45 **EN 1991-1-3, cl. 4.1, 4.2(1) & 5.2**

See remarks to p. 2-16 (a).

p. 2-46 (a) **EN 1991-1-4, cl. 4.5**

See remarks to p. 2-19 (c).

p. 2-46 (b) **EN 1991-1-4, cl. 4.2(2)**

The recommended values of c_{dir} = 1,0 and c_{season} = 1,0 are adopted.
There are no corresponding factors in standard SIA 261:2014.

p. 2-49 (a) **EN 1991-1-4, cl. 4.5 & cl. 6.3.1**

See remarks to p. 2-19 (c) and p. 2-26.

p. 2-49 (b) **EN 1991-1-4, cl. 4.2(2)**

The recommended values of c_{dir} = 1,0 and c_{season} = 1,0 are adopted.
There are no corresponding factors in standard SIA 261:2014.

p. 2-51 **EN 1991-1-4, cl. 5.3(5) & 7.2.2(3)**

The recommendations of EN 1991-1-4 apply.

Modelling

No annex required for this chapter

Annex CH 4

Analysis

p. 4-5 EN 1993-1-1, cl. 5.2.1(3)

The recommendations of EN 1993-1-1 apply. The limit values α_{cr} for elastic and plastic analysis apply according to EN 1993-1-1, cl. 5.2.1(3).
For elastic analysis, the regulation is in accordance with standard SIA 263, cl. 4.2.4.1.
For plastic analysis, there is no corresponding regulation in standard SIA 263, but standard SIA 263, cl. 4.2.4.2 points out that the reduction in stiffness due to the formation of plastic joints must be considered.

p. 4-8 EN 1993-1-1, cl. 5.3.2(3)

The recommendations of EN 1993-1-1 apply.
The initial deflections e_0 according to table 5.1 of EN 1993-1-1 apply.
This provision is in accordance with standard SIA 263, cl. 4.2.3.

p. 4-9 + 4-10 EN 1993-1-1, cl. 5.3.2(11)

The imperfections of the supporting structure may be determined based on the governing eigenfigure of the entire supporting structure, as long as the internal forces of the entire system are determined according to the theory of elasticity and the yield point is not exceeded anywhere.
This provision is in accordance with standard SIA 263, cl. 4.2.3 and 4.2.4.

p. 4-11 + p. 4-36 EN 1993-1-1, cl. 5.2.2(8)

The recommendations of EN 1993-1-1 apply. The scope of application of cl. 5.2.2(8) of EN 1993-1-1 is not restricted.
This provision is in accordance with standard SIA 263, cl. 4.2.2.

p. 4-37 EN 1993-1-1, cl. 5.3.2(11)

The imperfections of the supporting structure may be determined based on the governing eigenfigure of the entire supporting structure, as long as the internal forces of the entire system are determined according to the theory of elasticity and the yield point is not exceeded anywhere.
This provision is in accordance with standard SIA 263, cl. 4.2.3 and 4.2.4.

p. 4-39 EN 1993-1-1, cl. 5.3.4

The recommendations of EN 1993-1-1 apply.
The recommended value of k = 0,5 is adopted.

Analysis methods

No annex required for this chapter

Annex CH 6

Assessment by code checking

p. 6-9 + 6-42 EN 1990, cl. A1.4.2

The national annex to EN 1990 specifies the serviceability criteria. The specified guide values for the deflection of slabs and beams, the horizontal displacement of walls, frames and columns, the eigenfrequencies of buildings and the deflections and displacements of crane girders and columns are in conformity with the indications in tables 3 to 5 and table 16 of standard SIA 260:2013.

Deviating limit values for deflections and horizontal displacements can be agreed in accordance with the requirements of use and must be specified in the project basis.

p. 6-28 (a + b) EN 1993-1-1, cl. 6.1(1)

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:

$\gamma_{M0} = \gamma_{M1} = 1{,}05$;

$\gamma_{M2} = 1{,}25$.

This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} and γ_{M1}.

In the example on page 28, this means that $M_{c,Rd} = M_{pl,Rd} = 786$ kNm and $M_{c,Rd} = M_{el,Rd} = 687$ kNm.

p. 6-29 + 6-30 EN 1993-1-1, cl. 6.2.6

There is no national annex to EN 1993-1-1, cl. 6.2.6. However, the standard SIA 263, cl. 5.1.4.1 defines A_v only for bisymmetric profiles. For further definition of shear area A_v see EN 1993-1-1, cl. 6.2.6(3).

The definition of A_w varies slightly in SIA 263, cl. 1.2.5 ($A_w = (h-t_f)\cdot t_w$) compared to EN 1993-1-1, cl. 6.2.6(5) ($A_w = h_w \cdot t_w$). The definition of h_w given in the book is $h_w = h - 2t_f$ whereas according to SIA 263, cl. 1.2.5 $h_w = h-t_f$. EN 1993-1-1 defines h_w as “height of the web” but does not give any further specification.

p. 6-31 (a + b) + 6-34 + 6-41 (a + b) EN 1993-1-1, cl. 6.1(1)

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0} = \gamma_{M1} = 1{,}05$;
$\gamma_{M2} = 1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} and γ_{M1}.
In the example on page 31, this means that $V_{pl,Rd}$ = 1'083 kN and $V_{el,Rd}$ = 871 kN.
And in the example on page 34, $N_{pl,Rd}$ = 467 kN.
In the example on page 41, buckling about the strong axis $N_{b,Rd}$ = 518 kN and about the weak axis $N_{b,Rd}$ = 1000 kN.

p. 6-43 EN 1990, cl. A1.2.2, table A1.1

In the Swiss national annex the factor Ψ_2 for snow for the quasi-permanent load combination is defined as $\Psi_2 = 1 – 1000/h_0$. See annex for Switzerland, chapter 1.

p. 6-44 EN 1993-1-8, cl. 3.1.1(3)

The Swiss national annex excludes the bolt classes 4.8, 5.8 and 6.8 from use in Switzerland. These classes are not used because the fracture elongation is considered too low. Standard SIA 263, cl. 3.4.2 specifies the common screw qualities in Switzerland (classes 4.6, 5.6, 8.8 and 10.9).

Annex CH 7

Resistance of cross-sections

p. 7-2 + 7-8 + 7-10 + 7-12 — EN 1993-1-1, cl. 6.1(1)

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0} = \gamma_{M1} = 1{,}05$;
$\gamma_{M2} = 1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} und γ_{M1}.
Thus, the results vary slightly in several examples in this chapter:

- example 7.1, page 8: $N_{pl,Rd} = 895$ kN $< N_{Ed} = 900$ kN. Hence the tension resistance of the gross cross-section would be insufficient.
- example 7.2, page 10: $N_{c,Rd} = 1214$ kN
- example 7.3, page 12: $M_{c,Rd} = M_{pl,Rd} = 249$ kNm

p. 7-14 (a) — EN 1993-1-1, cl. 6.2.6

There is no national annex to EN 1993-1-1, cl. 6.2.6. However, the standard SIA 263, cl. 5.1.4.1 defines A_v only for bisymmetric profiles. For further definition of shear area A_v see EN 1993-1-1, cl. 6.2.6(3).

The definition of A_w varies slightly in SIA 263, cl. 1.2.5 ($A_w = (h-t_f) \cdot t_w$) compared to EN 1993-1-1, cl. 6.2.6(5) ($A_w = h_w \cdot t_w$). The definition of h_w given in the book is $h_w = h - 2t_f$ whereas according to SIA 263, cl. 1.2.5 $h_w = h-t_f$. EN 1993-1-1 defines h_w as “height of the web” but does not give any further specification.

p. 7-14 (b) — EN 1993-1-5, cl. 5.1(2)

$\eta = 1{,}2$ for steel grades up to and including S460, and $\eta = 1{,}0$ for steel grades with higher strengths.
Alternatively, whatever the steel grade, it is allowed to select $\eta = 1{,}0$ being on the safe side.

p. 7-16 + 7-21 EN 1993-1-1, cl. 6.1(1)

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0} = \gamma_{M1} = 1{,}05$;
$\gamma_{M2} = 1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} und γ_{M1}.
Thus, the results vary slightly in several examples in this chapter:

- example 7.4, page 16: $V_{pl,Rd} = 410$ kN
- example 7.6, page 21: $M_{y,V,Rd} = 245$ kNm

p. 7-18 + 7-22 + 7-28 (a) EN 1993-1-1, cl. 6.2.8, 6.2.9 and 6.2.10

There is no national annex defined to these clauses. So EN 1993-1-1 is applicable without restrictions.
In the Swiss standard SIA 263, the interaction relationships are represented in the same content, formally slightly different.

- Bending and shear:
  - In the Swiss standard SIA 263 equation 7.40 is given particularly for double-symmetric I-sections and for square and rectangular hollow sections of the cross-section classes 1, 2 and 3. Additionally the adapted equation is given for double-symmetric I-sections of class 4.
  - For cross-section classes 1 and 2 see SIA 263, cl. 5.1.5.
  - For cross-section class 3 see SIA 263, cl. 5.2.5.
  - For cross-section class 4 see SIA 263, cl. 5.3.6.

- Bending and axial force:
  - For cross-section classes 1 and 2 see SIA 263, cl. 5.1.6.
  - For cross-section class 3 see SIA 263, cl. 5.2.6.
  - For cross-section class 4 see SIA 263, cl. 5.3.5.

- Bending, shear and axial force:
  - For cross-section classes 1 and 2 see SIA 263, cl. 5.1.7 and 5.1.8.
  - For cross-section class 3 see SIA 263, cl. 5.2.7 and 5.2.8.
  - For cross-section class 4 see SIA 263, cl. 5.3.7.

p. 7-26 (a + b) + 7-27 (a + b) + 7-28 (b) + 7-40 + 7-43 + 7-44 EN 1993-1-1, cl. 6.1(1)

The partial safety factors γ_{Mi} for buildings and for structures not covered by EN 1993-2 to EN 1993-6 are defined as follows:
$\gamma_{M0} = \gamma_{M1} = 1{,}05$;
$\gamma_{M2} = 1{,}25$.
This provision is in accordance with standard SIA 263, cl. 4.1.3. Standard SIA 263 makes no distinction between γ_{M0} und γ_{M1}.
Thus, the results vary slightly in several examples in this chapter:

- example 7.7, page 26: $M_{c,Rd} = 141$ kNm, $N_{pl,Rd} = 1204$ kN,
- example 7.7. page 27: $\frac{0.5 \cdot h_w \cdot t_w \cdot f_y}{\gamma_{M0}} = 221\ kN$ (OK)
- example 7.8, page 27: $\frac{0.5 \cdot h_w \cdot t_w \cdot f_y}{\gamma_{M0}} = 221\ kN$ (not OK)
- example 7.9, page 28: $V_{pl,Rd} = 332$ kN
- example 7.10, page 40: $M_{pl,y,Rd} = 242$ kNm
- example 7.11, page 43: $M_{pl,y,Rd} = 216$ kNm. Hence the reduced moment resistance of the HEA 280 beam would be insufficient.
- example 7.11, page 44: $M_{pl,y,Rd} = 228$ kNm