Clause	Additional information required
B.2	Scope of dimensional checking for dimple measurements (see Table B.11)
Annex C – Check-list for the content of a quality plan	
C.2.3.4	Requirements for keeping records for more than ten years
Annex F – Corrosion protection	
F.1.2	Performance specification for corrosion protection
F.1.3	Prescriptive requirements for corrosion protection
F.4	Requirements for friction surfaces and class of treatment or tests required Extent of surfaces that are affected by the preloaded bolts in non-slip resistant connections
F.6.3	Requirements for procedure qualification of the dipping process if hot dip galvanizing of cold-formed components after manufacture is specified Requirements for the inspection, checking or qualification of the preparation to be carried out before subsequent overcoating, for hot dip galvanized components
F.7.3	Reference areas for corrosion protection systems in corrosivity categories C3 to C5 and Im1 to Im3
F.7.4	Components for which post-galvanizing inspection is not required Components or specific locations that shall be subjected to additional NDT together with the scope and method to be used

A.2 Options

This Annex lists the items which may be specified in the execution specification to define requirements for the execution of the work where options are given in this European Standard (i.e. where the wording such as “unless otherwise specified” or “shall be specified if” is used).

Table A.2 —Options

Clause	Option(s) to be specified
4 – Specifications and documentation	
4.2.2	If a quality plan for execution of the works is required
5 – Constituent products	
5.2	If traceability for each individual constituent product is specified
5.3.1	If structural steel products other than those listed in Tables 2, 3 and 4 are to be used
5.3.2	If other thickness tolerances for structural steel plates are specified
5.3.3	If discontinuities such as cracks, shell and seams are to be repaired
5.3.4	If internal discontinuity quality class S1 for welded cruciform joints If areas close to bearing diaphragms or stiffeners are to be checked for the existence of internal discontinuities

Clause	Option(s) to be specified
5.4	Options for steel castings If other evaluations than testing are required If other acceptance criteria are required
5.5	If other options than those in Table 6 are to be used
5.6.3	If fasteners according to EN ISO 898-1 and EN ISO 898-2 can be used to join stainless steels according toEN 10088-4 or EN 10088-5
5.6.4	If stainless steel bolting assemblies may be used in preloaded applications
5.6.7	If reinforcing steels may be used for foundation bolts together with the steel grade
5.6.8	If locking devices are required If other products than those in the referred standards are to be used
6 – Preparation and assembly	
6.2	If other requirements apply to hard stamped numbers, punched or drilled marks If soft or low stress stamps may be used If soft or low stress stamps may not be used for stainless steels
6.4.3	Other quality requirements to cut surfaces than those of Table 9
6.4.4	If hardness of free edge surfaces is specified for carbon steels If other requirements are specified for the check of the capability of cutting processes
6.5.2	If hot forming of stainless steel is permitted
6.5.3.1	If a documented procedure for flame straightening is required for steel grade S355 and below
6.5.4	Other minimum bending radii for stainless steels to referred grades Other conditions for circular tubes bending by cold forming
6.6.1	Other nominal clearances for bolt or pin diameter less than 12 mm or more than 36 mm Other nominal clearance for normal round holes for applications such as towers and masts If 12 and 14 mm or countersunk bolts may be used in 2 mm clearance holes
6.6.2	Other tolerances on hole diameter
6.6.3	If holes outside of identified limits shall not be formed by punching
6.7	If re-entrant corners or notches may be rounded off with other minimum values of radius. If punched cut outs are not permitted
6.8	If full contact bearing surfaces are required
7 – Welding	
7.2.2	If the conditions for welding cold formed zone according to EN 1993–1–8:2005, 4.14 are not required
7.4.1.1	If special deposition conditions for tack welds are required If work instructions are to be used for EXC1
7.4.1.2	If standard welding procedures may be used for EXC3 or EXC4 (in Table 12) Alternative conditions to testing in accordance with EN ISO 9018

Clause	Option(s) to be specified
7.4.2.2	Alternative qualification procedures for welders of branch connections
7.5.1.1	If cope holes may have a radius less than 40 mm
7.5.4	Other specification than in Annex E for assembly of hollow section components to be welded
7.5.6	If chipping and gouging are permitted on grades ≥ S460 or on components subject to fatigue
7.5.8.2	If end returns on fillet welds are not to be completed
7.5.9.1	For EXC2, if run-on/run-off pieces are required for full penetration transverse butt welds For EXC2, EXC3 and EXC4, if run-on/run-off pieces are required for full penetration longitudinal butt welds or partial penetration butt welds If a flush surface is required
7.5.9.2	If permanent steel backing material are not to be used for single side welds If flush grinding of single-sided butt welds in joints between hollow sections executed without backing is permitted
7.5.13	If plug welds performed without previous slot welding are permitted
7.5.16	If, for steel grades ≥ S460, removing of weld spatter is not required.
7.6.1	If, for EXC1, EXC2 and EXC3, other acceptance criteria for weld imperfections are required
7.6.2	Alternative criteria if acceptance criteria for welds subject to fatigue are not to be specified in terms of detail category (DC) If acceptance criteria to Annex C of EN ISO 5817:2014 are to be used
7.6.3	Requirements for welds in orthotropic bridge decks
8 – Mechanical fastening	
8.2.1	If, in addition to tightening, other measures or means are to be used to secure the nuts If preloaded assemblies require additional locking devices If bolts and nuts may be welded
8.2.2	If nominal fastener diameter may be less than M12 for structural bolting
8.2.4	If washers are required for non-preloaded bolt connections If washers are not required under both the bolt head and the nut for single lap connections with only one bolt row If plate washers are not required for connections with slotted and oversized holes
8.3	If full contact bearing is specified
8.5.1	Other nominal minimum preloading force value together with the relevant bolting assemblies, tightening method, tightening parameters and inspection requirements If a lower level of preload is required If there are restrictions on use of any of the tightening methods given in Table 19 If calibration to Annex H for the torque method is permitted If additional measures are to be taken to offset possible subsequent loss of preloading force
8.5.4	If other values than those given in Table 20 are specified

Clause	Option(s) to be specified
	If other values than those given in Table 21 are required for the second step
8.5.5	If the first step of HRC method is to be repeated
8.6	If the length of the threaded portion of the shank of the fit bolt (including thread run out) included in the bearing length may exceed 1/3 of the thickness of the plate
8.7.2	If a flush surface of countersunk rivets is required
8.7.3	If outer faces of plies are to be free of indentation by the riveting machine
9 – Erection	
9.4.1	If site measurements for the works shall be related to other system than the system established for the setting out and measurement of the construction works
9.5.3	If compensation for settlement of supports is not acceptable
9.5.4	If packings subsequently to be grouted, may be placed so that the grout does not totally enclose them If packings for bridges may be left in position If levelling nuts on the foundation bolts under the base plate are to be removed
9.5.5	If tamping and ramming against properly fixed supports are to be used If treatment of steelwork, bearings and concrete surfaces is required before grouting
9.6.5.2	If it is required that bracings in tall buildings are to be de-stressed as erection progresses
9.6.5.3	If material of shims is to be different from flat steel If drifts may not be used to align connections
10 – Surface treatment	
10.2	If there are requirements for surface cleanliness of stainless steels If a preparation grade other than P1 is to apply If preparation grade P2 or P3 are to be used for corrosion category above C3 and expected life of the corrosion protection longer than 15 years
10.5	If enclosed spaces are to be sealed after hot dip galvanizing and, if so, with what product If blasting prior to hot dip galvanizing is required, and the requirements if so
10.6	If weld imperfections permitted under the execution specification require sealing by application of suitable filler material to prevent the ingress of moisture If sealing welds require further inspection after visual inspection
10.7	If there are specific requirements for coating surfaces in contact with concrete
10.8	If faying surfaces and surfaces beneath washers are to be treated with other than primer and midcoat If bolted connections including the perimeter around such connections are to be treated with other than the full corrosion protection system specified for the remainder of the steelwork
10.9	If repair, or additional protective treatment, is required to cut edges and adjacent surfaces after cutting

Clause	Option(s) to be specified
11 – Geometrical tolerances	
11.1	If special tolerances are required
11.2.3.5	If shims may not be used to reduce the gap of bolt splices in full contact bearing
11.3.1	If the alternative criteria for functional tolerances in 11.3.3 apply
11.3.2	Individual components or selected parts of an erected structure to which tolerance class 2 applies
11.3.3	If specified alternative criteria are to be applied
12 – Inspection, testing and corrections	
12.2.1	If there are requirements for specific testing of constituent products
12.3	Other methods for repairing damage resulting in local dents in the surface of hollow sections
12.4.2.1	If parent metal is to be inspected for laminations after welding
12.4.2.3	If other rules are required for definition of the percentage extent of testing
12.4.2.4	If specific joints are identified for inspection together with the extent and method of testing for EXC1, EXC2 and EXC3 If weld inspection classes are to be used for defining the scope and percentage extent of supplementary, and, if so, the weld inspection class for each relevant weld
12.4.4	If production tests are required for EXC3 and EXC4
12.5.2.4	Other inspection method than sequential sampling plan in Annex M If checking of over-tightening is required for the torque method
12.5.2.5	If a check for over-tightening using the torque method is required and, if so, the requirements for the check
12.7.3.1	If detailed specific dimensional checks at acceptance are required
12.7.3.4	Extent of measurements for the survey of geometrical position of connection nodes if other than site interconnection nodes Conditions of measurements other than under the self-weight of steelwork
12.7.3.6	An envelope of permissible positions if significant movement of a structure is anticipated that could affect dimensional checking
12.7.4	Tolerance range on the load, if components of a structure are to be erected to a specific load
Annex D – Procedure for checking capability of automated thermal cutting processes	
D.1	If the verification of the quality of the cut surfaces shall not be done under the authority of the responsible welding coordinator
Annex E – Welded joints in hollow sections	
E.4(d)	If the hidden toe area is not to be welded

Clause	Option(s) to be specified
Annex F – Corrosion protection	
F.1.2	If a performance specification is to be used
F.2.2	Other requirements than the EN ISO 8501 series and EN ISO 1461 for surface preparation of carbon steels
F.5	If the lower embedded part of foundation bolts are not to be left untreated
F.7.2	Other requirements for the extent of checking required for paint treatment
F.7.3	If reference areas are not to be specified for corrosion protection systems in Corrosivity Categories C3 to C5 and Im1 to Im3
F.7.4	If hot dip galvanized components are not subjected to post-galvanizing inspection (LMAC)
Annex G – Determination of slip factor	
G.5	If the design life of the structure is other than 50 years
G.6	If extended creep testing is required
Annex I – Determination of loss of preload for thick surface coating	
I.1	Preloads form bolting assemblies tightened that are to be tightened and re-tightened by the torque method (see Table I.1)

A.3 Requirements related to the execution classes

This clause lists requirements specific to each of the execution classes referenced in this European Standard. “Nr” in the Table means: No specific requirement in the text.

Items identified with [PC] in Table A.3 relate to the general system of control of execution and are amenable to a common choice of execution class across the whole of the works (or a phase of the works). The other items identified with [PS] generally demand the selection of the appropriate execution class on a component–by-component or a connection detail-by-detail project specific basis.

Table A.3 — Requirements to each execution class

Clauses	EXC1	EXC2	EXC3	EXC4
4 – Specifications and documentation				
4.2 Constructor’s documentation				
4.2.1 Quality documentation [PC]	Nr	Yes	Yes	Yes
5 – Constituent products				
5.2 Identification, inspection documents and traceability				
Traceability [PC]	Nr	Yes (by marking)	Yes (from receipt to handover)	Yes (from receipt to handover)
Marking [PC]	Nr	Yes	Yes	Yes

Clauses	EXC1	EXC2	EXC3	EXC4
6 – Preparation and assembly				
6.4 Cutting				
6.4.3 Thermal cutting [PC]	See Table 9	See Table 9	See Table 9	See Table 9
7 – Welding				
7.1 General				
7.1 General [PC]	EN ISO 3834-4	EN ISO 3834-3	EN ISO 3834-2	EN ISO 3834-2
7.4 Qualification of welding procedures and welding personnel				
7.4.1 Qualification of welding procedures				
7.4.1.1 General [PC]	Appropriate work instructions (if specified to be used)	See EN ISO 3834-3	See EN ISO 3834-2	See EN ISO 3834-2
7.4.1.2 Qualification of welding procedures [PC]	Nr	See Table 12	See Table 12	See Table 12
7.4.2.1 Welding and welding operators [PC]	Revalidation frequency specified	See EN ISO 3834-3	See EN ISO 3834-2	See EN ISO 3834-2
7.4.3 Welding coordination [PC]	Sufficient supervision	Technical knowledge according Tables 14 or 15	Technical knowledge according Tables 14 or 15	Technical knowledge according Tables 14 or 15
7.5 Preparation and execution of welding				
7.5.1 Joint preparation				
7.5.1.1 General [PC]	Nr	Prefabrication primers not allowed unless tested	Prefabrication primers not allowed unless tested	Prefabrication primers not allowed unless tested
7.5.6 Temporary attachments [PS]	Nr	Nr	Restrictions on use may be specified	Restrictions on use may be specified
7.5.7 Tack welds [PC]	Nr	Qualified welding procedure	Qualified welding procedure	Qualified welding procedure

Clauses	EXC1	EXC2	EXC3	EXC4
7.5.9 Butt welds				
7.5.9.1 General [PC]	Nr	Run on/run off pieces for full penetration transverse butt welds (if specified) Run-on/run-off pieces for full penetration longitudinal butt welds or partial penetration butt welds (if specified)	Run on/run off pieces for full penetration transverse butt welds Run-on/run-off pieces for full penetration longitudinal butt welds or partial penetration butt welds (if specified)	Run on/run off pieces for full penetration transverse butt welds Run-on/run-off pieces for full penetration longitudinal butt welds or partial penetration butt welds (if specified)
7.5.9.2 Single sided welds [PC]	Nr	Nr	Permanent backing continuous	Permanent backing continuous
7.6 Acceptance criteria				
7.6.1 Routine requirements [PC] [PS for EXC4]	EN ISO 5817 Quality level D generally	EN ISO 5817 Quality level C generally	EN ISO 5817 Quality level B	EN ISO 5817, EXC3 as a minimum with specific criteria for identified welds
7.6.2 Fatigue requirements [PC]	Not applicable	EN ISO 5817:2014, Annex C (if specified to be used)	EN ISO 5817:2014, Annex C (if specified to be used)	EN ISO 5817:2014, Annex C (if specified to be used)
9 – Erection				
9.6 Erection and work at site				
9.6.3 Handling and storage on site [PC]	Nr	Documented restoration procedure	Documented restoration procedure	Documented restoration procedure
12 – Inspection, testing and repair				
12.4 Welding				
12.4.2 Inspection after welding				
12.4.2.3 Routine inspection [PC]	NDT: See Table 24	NDT: See Table 24	NDT: See Table 24	NDT: EXC3 to Table 24 as a minimum
12.4.2.4 Project specific inspection [PS]	See Table A.2	See Table A.2	See Table A.2	Identified joints for inspection together with the extent of testing
12.4.2.7 Correction of welds [PC]	Nr	According to WPS	According to WPS	According to WPS

Clauses	EXC1	EXC2	EXC3	EXC4
12.5 Mechanical fastening				
12.5.2 Inspection and testing of preloaded bolted connections				
12.5.2.3 Before tightening [PC]	Nr	Checking of tightening procedure	Checking of tightening procedure	Checking of tightening procedure
12.5.2.4 During and after tightening [PC]	Nr	5 % of second tightening step using Sequential type A (unless otherwise specified)	5 % of first tightening step and 10 % of second tightening step using Sequential type A (unless otherwise specified)	5 % of first tightening step and 10 % of second tightening step using Sequential type B (unless otherwise specified)
12.5.2.5 Torque method [PC]	Nr	See Table 25	See Table 25	See Table 25
12.5.2.6 Combined method [PC]	Nr for check of first tightening step	Nr for check of first tightening step	Check of first tightening step before marking	Check of first tightening step before marking
12.5.2.7 HRC method [PC]	Nr	Inspection of first tightening step	Inspection of first tightening step	Inspection of first tightening step
12.5.3.1 Inspection, testing and repair of solid rivets for hot riveting [PC]	Nr	Ring test Sequential type A	Ring test Sequential type A	Ring test Sequential type B
12.7 Erection				
12.7.3.1 Survey of the geometrical position of connection nodes [PC]	Nr	Nr	Record of the survey	Record of the survey

Annex B
(normative)

Geometrical tolerances

B.1 General

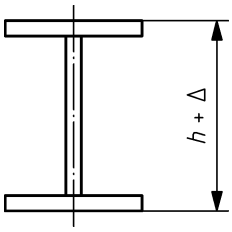
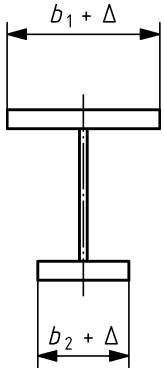
Permitted deviations for essential and functional manufacturing tolerances are tabulated in Tables B.1 to B.14.

Permitted deviations for essential and functional erection tolerances are tabulated in Tables B.15 to B.25.

NOTE See prEN 1090–4 for the manufacturing tolerances for cold formed profile sheets and the erection tolerances for profiled steel sheeting.

B.2 Manufacturing tolerances

Table B.1 — Manufacturing tolerances - Welded profiles

No	Criterion	Parameter	Essential tolerances Permitted deviation Δ	Functional tolerances Permitted deviation Δ	
			Class 1 and 2	Class 1	Class 2
1	Depth 	Overall depth h: $h \leq 900$ mm $900 < h \leq 1800$ mm $h > 1800$ mm	- Δ = h /50 (note negative sign)	Δ = ± 3 mm Δ = ± h /300 Δ = ± 6 mm	Δ = ± 2 mm Δ = ± h /450 Δ = ± 4 mm
2	Flange width: 	Width $b = b_1$ or b_2:	- Δ = b /100 (note negative sign)	+ Δ = b /100 but |Δ| ≥ 3 mm	+ Δ = b /100 but |Δ| ≥ 2 mm