Annex A
(normative)

Required additional information, options to be specified and requirements for execution classes

A.1 List of required information

This clause lists in Table A.1 the additional information that is required in the text of this document as appropriate to fully define the requirements for execution of the work to be in accordance with this document (i.e. where the wording "shall be specified" is used).

Table A.1 — List of clauses with subjects where additional information is necessary

Clause	Subject
4.1.2	The execution class(es) to be applied.
4.2.2	If a quality plan for execution of works is required.
5.1	The constituent products to be used.
5.3	Requirements for testing of cast parts.
5.5	Combination of parent material and welding consumables.
5.6.1	Category of bolted connections, product standards, property classes and any other requirements, e.g. surface treatment.
5.7	Requirement for short and long term behaviour of adhesives.
6.4	If sharp edges shall be removed due to technical reasons.
6.6	Hole sizes.
6.6	Dimensions of any countersinking for bolts.
6.6	Dimensions of any countersinking for rivets.
6.6	Effective length of any slotted holes.
6.9	If a complete assembly check is required.
7.3	If other welding processes than MIG is intended to be used
7.5.1	Requirements for welding if other welding processes than those stated in 7.3 are used.
7.5.1	Requirement to grinding of the surface of the weld
7.5.5	If welding of temporary attachments is permitted. Locations where temporary attachments are not allowed.
7.5.8	Location of butt weld for splicing of constituent products
7.5.9	Dimensions for holes for slot and plug welds.
7.5.10	If fillet welds finishing at the ends or sides of parts should return continuously
7.5.13	Requirements for other welds, e.g. spot or stud welds, made by other processes than stated in 7.3.

Clause	Subject
8.1.3	The extent of contact surfaces in slip resistant connections.
8.2.6	The use of normal or oversized washers.
8.5	Method for execution of bonded joints. Requirements for inspection, extent of testing and acceptance criteria.
10.1	Each protective treatment
10.1	Fire protection systems
10.2	Coating, anodizing or passivation
10.2	Protection treatment of inner surface of hollow section
10.3.1	Nature and extent of all protection measures (surfaces and contact surfaces).
11.1	Any special tolerances.
11.2.2.5	Tolerance class for shell structures.
12.3.2	Location and frequency of geometrical checks.
12.4.3.1	The minimum extent of inspection and quality requirements for welded joints.
12.4.4.1	The quality requirements for welds for service category SC1.
12.4.4.2	The quality requirements for welds for service category SC2.
12.5.1	Requirements for checking the insulated connections.
12.5.2.3	Non slip resistant bolting assemblies.
12.6	Method and minimum extent of inspection for adhesive bonding

A.2 List of options to be specified

This clause lists the items, for which this document gives one option, however, where alternatively other options might be specified. If no alternative options are specified, the options given in this document apply.

Table A.2 — List of clauses where options might be specified

Clause	Subject
4.2.1	If a quality documentation is required for EXC2.
5.6.1	If surface treatment of mechanical fasteners is specified.
6.6	If other clearances than given in Table 6 should be used.
6.6	If removal of burrs for holes drilled in assembled parts is necessary.
7.5.8	If run-on/run-off pieces shall be used for EXC2.
8.2.5	If locking devices for nuts are required.
8.3.1	If locking devices shall be used.
8.3.2	The tightening method for pre-loaded non slip resistant connections.
10.3.2	Corrosion protection on aluminium surfaces in case of contact with aluminium and plastic.
10.3.3	Corrosion protection on aluminium surfaces in case of contact with steel or wood.

Clause	Subject
10.3.4	Corrosion protection on aluminium surfaces in case of contact with concrete, brickwork and plaster, etc.
10.3.5	Sealing measures for fasteners.
11.2.3.3.3	If shims are allowed to be held in place by welding.
12.4.1	If check of fit-up before welding is required.
12.4.3.1	Any additional tests and testing methods for inspection of welds.
12.4.3.2	Any additional provisions to decide the minimum extent of testing.
12.4.3.3	If destructive testing shall be executed.

A.3 Requirements related to execution classes

This clause gives the requirements that depend on the execution classes.

Table A.3 — Requirements for execution classes

Clause	Heading	Execution class EXC1	Execution class EXC2	Execution class EXC3	Execution class EXC4
4 Specifications and documentation					
4.2.1	Quality documentation	None	If specified	Yes	Yes
5 Constituent products					
5.2	Inspection documents for structural aluminium	Test report 2.2	Inspection certificate 3.1	Inspection certificate 3.1	Inspection certificate 3.1
5.2	Inspection documents for welding consumables	Test report 2.2	Inspection certificate 3.1	Inspection certificate 3.1	Inspection certificate 3.1
5.2	Traceability	None	None	Yes	Yes
5.2	Marking of alloy and temper	None	Yes, if different alloys and tempers are in circulation together	Yes, if different alloys and tempers are in circulation together	Yes, if different alloys and tempers are in circulation together
6 Preparation					
6.2	Marking or identifying of constituent products	None	Yes, if different alloy and tempers are in circulation together	Yes, if different alloy and tempers are in circulation together	Yes, if different alloy and tempers are in circulation together

Clause	Heading	Execution class EXC1	Execution class EXC2	Execution class EXC3	Execution class EXC4
6.2	Marking or identifying of parts during manufacturing	None	Yes	Yes	Yes
7 Welding					
7.1	Quality requirements for welding	EN ISO 3834-4 Elementary quality requirements	EN ISO 3834-3 Standard quality requirements	EN ISO 3834-2 Comprehen-sive quality requirements	EN ISO 3834-2 Comprehen-sive quality requirements
7.2.1	Welding plan	None	Yes	Yes	Yes
7.4.1	Welding procedures specifications	None	According to EN ISO 15609-1	According to EN ISO 15609-1	According to EN ISO 15609-1
7.4.1	Qualification of arc welding procedures	None	Qualified to EN ISO 15612 or EN ISO 15613 or EN ISO 15614-2	Qualified to EN ISO 15613 or EN ISO 15614-2	Qualified to EN ISO 15613 or EN ISO 15614-2
7.4.4	Welding co-ordination	None	As defined in EN ISO 14731	As defined in EN ISO 14731	As defined in EN ISO 14731
7.4.4	Welding co-ordination personnel	None	Technical knowledge according to Table 7	Technical knowledge according to Table 7	Technical knowledge according to Table 7
7.5.6	Tack welds	None	None	Conditions for deposition of tack welds in WPS	Conditions for deposition of tack welds in WPS
7.5.8	Butt welds	None	Run-on/run-off pieces to ensure full throat thickness if specified	Run-on/run-off pieces to ensure full throat thickness	Run-on/run-off pieces to ensure full throat thickness
8 Mechanical fastening and adhesive bonding					
8.2.5	Locking devices	If specified	If specified	If specified	Shall generally be secured
8.2.5	Assembly of nuts	None	None	Designation markings visible for inspection	Designation markings visible for inspection

Clause	Heading	Execution class EXC1	Execution class EXC2	Execution class EXC3	Execution class EXC4
12 Inspection, testing and corrections					
12.4.3.1	Test methods	Given in Table 9	Given in Table 9	Given in Table 9	Given in Table 9
The following subjects are given in an informative annex					
K.3.1	Recommended extent of additional NDT in SC1	Given in Table K.2	Given in Table K.2	Given in Table K.2	Given in Table K.2
K.3.2	Recommended extent of additional NDT in SC2	Given in Table K.3	Given in Table K.3	Given in Table K.3	Given in Table K.3

Annex B
(informative)

Checklist for the content of a quality plan

B.1 Introduction

In accordance with 4.2.2, this annex gives recommendations for items to be included in the scope of project-specific quality plans for the execution of aluminium structures with reference to the general guidelines in ISO 10005.

B.2 Content

B.2.1 Management

A project management organization plan that names key personnel, their function and responsibilities during the project, the chain of command and lines of communication.

Arrangements for planning and coordination with other parties throughout the project and for monitoring of performance and progress.

Identification of functions delegated to subcontractors and others not in-house.

Identification and proof of competence of qualified personnel to be employed on the project, including welding coordination personnel, inspection personnel, welders and welding operators.

Arrangements for controlling variations, changes and concessions that take place during the project.

B.2.2 Specification review

Requirement to review the specified project requirements to identify the implications including the choices of execution classes and utilization categories that would require additional or unusual measures beyond those assured by the company's quality management system.

Additional quality management procedures necessitated by the review of the specified project requirements.

B.2.3 Documentation

B.2.3.1 General

Procedures to control all received and issued project documentation, including identification of the current revision status and prevention of the use of invalid or obsolete documents in-house or by subcontractors, including drawings, calculations, electronic information and associated registers.

B.2.3.2 Documentation prior to execution

Procedures for providing the required documentation prior to execution of the construction step to which they relate. This will include:

— certificates for constituent products;

— weld procedure specifications and qualification records;

— method statements including those for erection and preloading fasteners;

— design calculations for temporary works necessitated by the erection methods;

— arrangements for scope and timing of second or third party approval or acceptance of documentation prior to execution.

B.2.3.3 Execution records

Procedures for providing execution records, including:

a) constituent products traced to completed components;

b) inspection and test reports and action taken to deal with nonconformities, concerning:

   1) preparation of joint faces prior to welding;

   2) welding and completed weldments;

   3) geometrical tolerances of manufactured components;

   4) surface preparation and treatment;

   5) calibration of equipment including those used for control of preloading of fasteners.

c) pre-erection survey results leading to acceptance that the site is suitable for erection to commence;

d) delivery schedules for components delivered to site identified to location in the completed structure;

e) dimensional surveys of the structure and action taken to deal with nonconformities;

f) certificates for completion of erection and handover.

B.2.3.4 Storage of records

Arrangements for making documentary records available for inspection, and for retaining them for a minimum period of 5 years, or longer if required by the project.

NOTE National provisions can have more stringent requirements for keeping the records.

B.2.4 Inspection and testing procedures

Identification of the mandatory tests and inspections required by this document and those provided in the constructor's quality system that are necessary for the execution of the project, including:

a) the scope of inspection;

b) acceptance criteria;

c) actions for dealing with nonconformities, corrections and concessions;

d) release/rejection procedures.

Project-specific requirements for inspection and testing, including requirements that particular tests or inspections are to be witnessed, or points where a nominated third party is to carry out an inspection.

Identification of hold points associated with second or third party witnessing, approval or acceptance of test or inspection results.

Annex C
(normative)

Cruciform weld test

C.1 Introduction

The purpose of this test is

a) for procedure test for fillet welds (strength and quality);

or

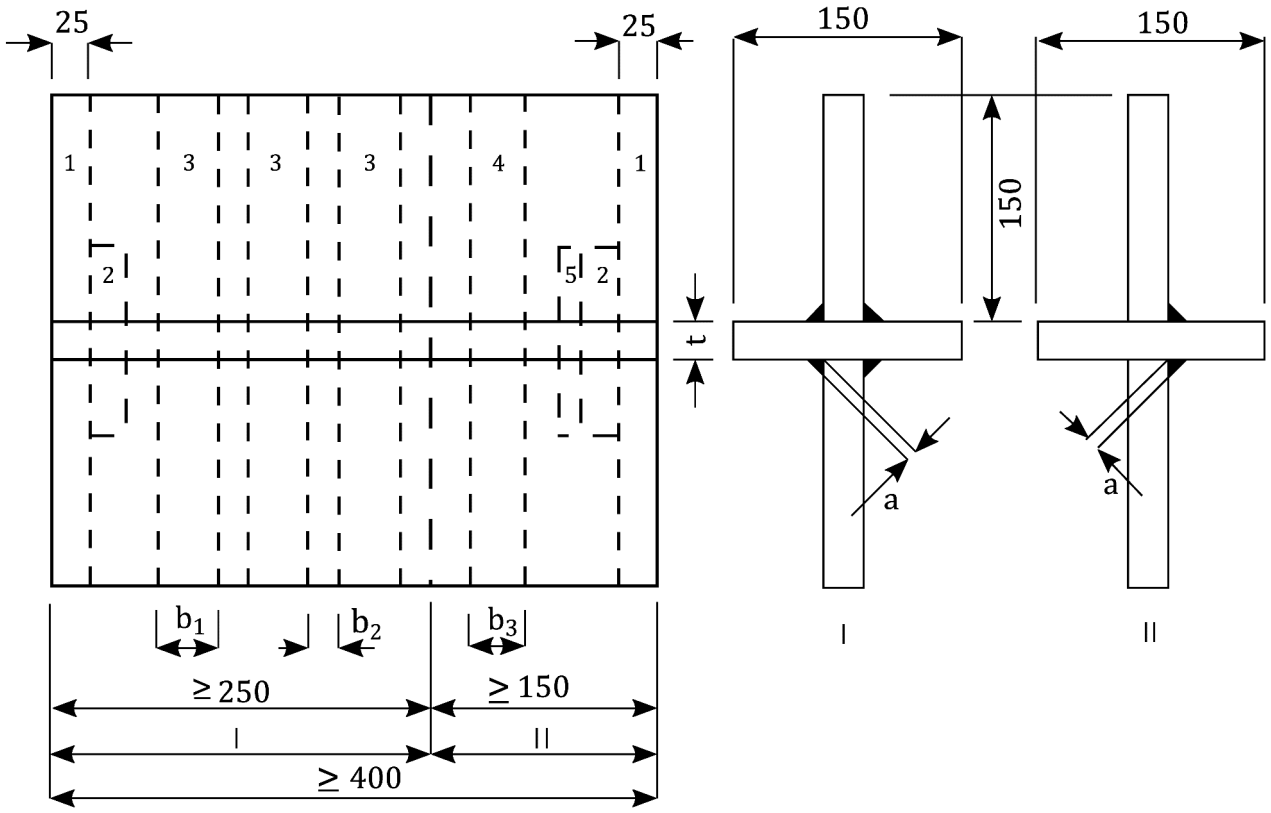
b) for checking material properties for plates made of EN AW-6082, according to 5.3.

C.2 Test piece

The test piece for a welding procedure test for fillet welds shall be prepared and welded according to Figure C.1.

For testing of material properties for plates made of EN AW-6082 only Section I is needed.

Dimensions in millimetres



Key

I	Section I	≥ 250 mm	1	discard 25 mm
II	Section II	≥ 150 mm	2	2 macro examination test specimens
			3	3 cruciform tensile test specimens
			4	1 fracture test specimen
			5	1 micro examination test specimen (only for material group 23 [precipitation hardening alloys] according to CEN ISO/TR 15608)

b_1	width of cruciform tensile test specimen ≥ 35 mm	
b_2	width of cutting ≤ 5 mm	
b_3	width of fracture test specimen ≥ 80 mm	
t	thickness of test piece	
a	throat of fillet weld	(t ≤ 8mm: a = 0,7 t) (t > 8 mm: a = 0,5 t)

Figure C.1 — Cruciform joint test piece for fillet welds

C.3 Examination and testing

Prior to cutting of the test specimens visual (100 %) and penetrate testing (100 %) shall be carried out.

The fracture test shall be carried out in accordance with EN ISO 9017.

NOTE 1 It is advised to carry out the fracture test prior to the cruciform tensile tests and the macroscopic/microscopic examination.

The cruciform tensile tests shall be carried out in accordance with EN ISO 9018.

For determining the tensile strength of the cruciform joint test specimen the strength of the fillet weld is calculated by determining an average effective throat thickness a_{eff} for the fillet weld of each test specimen. The tensile strength, defined as $R_{m,test} = N_{m,test}/2a_{eff}$ independent of the fracture mode (HAZ of or throat of the weld), shall fulfil the requirements of Table C.1. If the first test specimen breaks transverse in the HAZ of the parent material, the weld thickness of the following specimens shall be reduced by machining to enforce the fracture in the weld.

NOTE 2 EN ISO 17659:2004, Figure 14 and Table 8 define effective throat thickness.

The test specimens for the macroscopic/microscopic examination shall be prepared and examined in accordance with EN ISO 17639 and shall fulfil the requirements of EN ISO 15614-2. The acceptance levels shall fulfil the requirements of EN ISO 15614-2.

Table C.1 — Minimum strength values for tensile tests with cruciform test specimen (item 3 in Figure C.1) in N/mm^2

Alloy designation according to EN 573-3 and EN 573-2		**Temper as listed in EN 1999-1-1**	**Welding consumable according to EN 1999-1-1, alloy designation according to EN ISO 18273**		
EN AW-	**EN AW-**		**S-Al 5356/A S-Al 5556A/B S-Al 5183/A**	**S-Al 4043A S-Al 4047A**	**S-Al 3103**
			min R_m (N/mm^2)		
3004	AlMn1Mg1	all	126	126	67
3005	AlMn1Mg0,5	all	93	93	67
3103	AlMn1	all	-	67	67
5005 5005A	AlMg1(B) AlMg1(C)	all	81	81	-
5049	AlMg2Mn0,8	all	153	-	-
5052	AlMg2,5	all	120	-	-
5083	AlMg4,5Mn0,7	all	170	-	-
5383	AlMg4,5Mn0,9	all	170	-	-
5454	AlMg3Mn	all	156	-	-
5754	AlMg3	all	152		-
6060	AlMgSi	T66	89	89	-
		T6, T64	81	81	-