

Stavanger Steel AS – Technical Conditions for Supply of Castings

Abbreviations and Definitions

SSA – Stavanger Steel AS.

Product – The cast component to be manufactured by SSA.

Purchaser – The company or individual buying any cast components from SSA.

Reference Documents

/1/ NS-EN 1559-1:2011 Founding – Technical conditions of delivery – Part 1: General.

/2/ NS-EN 1559-2:2014 Founding – Technical conditions of delivery – Part 2: Additional requirements for steel castings.

/3/ ASTM A802

/4/ EN 1371-1:2015 Founding – Liquid penetrant testing – Part 1: Sand, gravity die, and low pressure die castings.

/5/ EN 10204: 2004 Metallic products – Types of inspection documents.

Preamble

1. These Technical Conditions shall be applied as an appendix to the General Conditions for Supply of Castings.
2. Where the Purchaser puts forward specific requirements for the cast product, the Purchaser's requirements shall have precedence over this document. In all other cases, unless otherwise agreed in writing or where the Purchaser requirements are lacking on certain points, SSA shall deliver the castings in accordance with these technical conditions of supply.
3. If the castings are to be classed according to the relevant classification society rules and regulations, these rules and regulations shall apply for the manufacture, testing and inspection of the castings.

Information to be Supplied by the Purchaser:

Mandatory Information

4. The Purchaser shall give clear information in the enquiry and purchase order, in particular on:
 - a. The number of castings to be supplied, the permissible deviations from this number, and the schedule of delivery
 - b. Specification of the cast material. In the case of castings made of standardized cast material, the following shall be specified:
 - i. The number of the relevant material standard.
 - ii. The designation of the cast material either by international standard name or by number.
 - c. Relevant drawings, standards, and technical specifications; in case of numerical data exchange provision shall be made for integrity of data.
 - d. Supply of pattern equipment, core boxes and permanent molds.
 - e. Requirements regarding the outer and inner conditions of the castings.
 - f. Relevant information for machining, such as location and clamping points.
 - g. Relevant wall thickness for material testing.
 - h. Method and extent (area and/or frequency) of non-destructive testing.
 - i. Method and extent (area and/or frequency) of machining to be carried out by the manufacturer.
 - j. Agreement of production welding, acceptance criteria and extent.
 - k. Any other special requirements, e.g., metallographic structure, corrosion resistance, and machineability.
 - l. Any requirement regarding confidentiality (including sub-contracting).

Optional Information

5. When applicable, the enquiry and purchase order shall include other requirements, such as:
 - a. The as-delivered condition.
 - b. Additional properties not specified in the material standard.
 - c. Mass of the castings.
 - d. Delivery of preliminary samples.
 - e. Delivery of initial samples.

Drawings, Patterns and Tools:

6. The Purchaser shall make available to SSA, the necessary drawing(s), e.g., drawing(s) of the as-cast casting and/or finished machined casting.
7. The Purchaser shall make available to SSA a 3D-model of the as-cast casting and/or finished machined casting.
8. It shall be stated whether a taper is to be added, subtracted, or averaged.
9. When applicable, for surfaces to be machined, the required machining allowances and datums for machining and for the dimensional check shall be specified on the drawing(s).
10. If the Purchaser is making available to SSA pattern equipment, tooling or permanent molds, their identification shall be specified in the order.
 - a. SSA shall check that patterns, tooling, or permanent molds are useable and complete. SSA shall have a say in the useability of any pattern equipment, tooling or permanent molds supplied by the Purchaser.
 - b. If the Purchaser chooses to disregard SSA recommendations with regards to modifications or the useability of any pattern equipment, tooling or permanent molds supplied by the Purchaser, SSA shall have no liability for defects connected to said equipment.
11. The casting tolerance grade and, where applicable, the required machining allowance grade shall be specified on the drawing or in the order.

Information on the Mass

12. If there is a tolerance on the mass for castings, agreement shall be made by the time of ordering as to whether the mass of a casting shall be the same as the mass calculated from the drawing or the mass of an initial sample with sizes within the size tolerances.
 - a. If no tolerance is put forward by the Purchaser, SSA shall deliver within the theoretical mass of +/- 10% of minimum and maximum size tolerances.

Preliminary and Initial Samples

13. If not agreed, SSA shall not supply any preliminary or initial samples.

Designations

14. Cast materials shall be in accordance with acknowledged international standards, or SSA material grade designation.

Requirements

Manufacture:

15. The manufacturing process shall be left to the discretion of SSA unless otherwise agreed by the time of ordering or otherwise specified in the product standard. The manufacturing process covers all operations up to the delivery of the casting(s).

General Requirements:

16. The castings shall comply with the requirements of the order.

Chemical Composition:

17. If not otherwise specified in the enquiry and order the requirements of the relevant material standard shall apply with regard to the chemical composition of the cast material.
18. If not otherwise specified in the enquiry and order, the data on the chemical composition of the cast material shall relate to the liquid metal, i.e., ladle analysis.

Mechanical Properties:

19. If not otherwise specified in the enquiry, order or product specification, the requirements of the relevant material standard shall apply with regard to the properties of the material.
20. Mechanical properties shall be measured on a test sample extracted from a test block. If nothing else is specified, the test-block shall have the following dimension:
 - a. For casting wall thicknesses 0 – including 120mm: 80x80x200 (*height x width/thickness x length*).
 - b. For casting wall thicknesses > 120mm: 120x120x180 (*height x width/thickness x length*)
21. Test blocks may be cast integrated, partially integrated or separate to the casting they represent.

This shall be decided by SSA if nothing else is specified from the Purchaser. The test blocks shall always be cast from the same heat as the castings they represent.
22. Test samples shall be extracted at T/4 position If not otherwise specified in the enquiry, order, or product specification.
23. The mechanical properties testing shall, if nothing else is specified in the enquiry, order, or product specification, include:
 - a. 1 set á 3 specimens of CVN-tests. Testing acc. to ISO 148-1.
 - b. 1 tensile test specimen. Testing acc. to ISO 6892-1.
24. Other material properties may be specified, but must be specified at the time of enquiry and order, or in the product specification.

25. In the case the results of the mechanical tests do not comply with the requirements of the product standard/specification, SSA can, unless otherwise agreed at the time of enquiry and order, adopt one of the following procedures:
- a. Repeat the mechanical test which failed on two additional test pieces. If either of the two new test pieces does not give satisfactory results, the manufacturer may then follow the procedure specified in c).
 - b. In the case of impact tests, if the average value obtained from three tests does not reach the specified value, or if one of the individual values does not reach the specified minimum, SSA may test three additional test pieces selected from the same test block or from another block from the same melt and heat-treated test unit to represent the relevant castings. SSA shall then add these results to those previously obtained and recalculate the average. If this new average conforms to the average value specified, then the material represented shall be considered to be in conformity. If the new average value or any of these new individual values are not conforming with the specified requirements, SSA may follow the procedure specified in c).
 - c. Castings and test blocks may be submitted to another heat treatment within the limits of the product standard, and then carry out all the mechanical tests required in the product standard, or 23) if nothing is specified, on the test blocks. Two additional heat-treatment cycles (excluding tempering) may be performed without consulting the Purchaser.

Non-Destructive Testing (NDT):

26. If not otherwise specified in the enquiry, order, or product specification the following scope and acceptance criteria for final NDT shall apply (intermediate testing before final inspection to be at SSA's discretion):
- a. VISUAL TESTING (VT)
 - i. All castings shall be subject to 100% VT.
 - ii. Acceptance criteria: ASTM A802 Table 1, Level 2: SCRATA Comparator plates: A2, B2, C1, D1, G1, H3 and J1.
 - b. PENETRANT TESTING (PT)
 - i. All castings shall be subject to 100% PT acc. to ref. /4/.
 - ii. Acceptance criteria, ref. /4/:
 1. Non-Linear indications: SP3 and CP3.
 2. Linear- and aligned indications: LP4 and AP4.
 - c. MAGNETIC PARTICLE TESTING (MT)
 - i. MT is not performed unless otherwise specified in the enquiry, order or product specification.
 - d. ULTRASONIC TESTING (UT)
 - i. UT is performed at SSA's discretion to ensure, in the best way possible, that no further defects are discovered during any subsequent machining.
 - e. RADIOGRAPHIC TESTING (RT)
 - i. RT is not performed unless otherwise specified in the enquiry, order or product specification.

Repair Welding:

27. Unacceptable defects found on NDT shall be repaired by welding or grinding. This applies for both the NDT acceptance criteria stated above, and Purchaser's NDT acceptance criteria, if any.
28. All welding shall be performed by certified welders.
29. All welding shall be performed according to an approved Weld Procedure Specification/Weld Procedure Qualification (WPQ).
30. Weld Repair documentation shall be at SSA's discretion.
 - i. For repair welds the NDT requirements of the parent material are valid, unless otherwise specified in the enquiry, order, or product specification.
31. Extent of weld repair shall be at SSA's discretion, unless otherwise specified in the order or product specification.
32. Weld Repair shall not be treated as a non-conformity, and the Purchaser will not be notified unless this is specified in the order or product specification.

Condition of the Casting:

33. The shapes and sizes of the castings shall conform to the requirements of the order and shall be as indicated on the supplied drawings, models, or templates.
34. Unless otherwise agreed by the time of ordering, the castings shall be supplied fettled, but unmachined. Gates and feeders shall be removed.

Type of Inspection Documents and Type of Inspection

35. Unless otherwise specified in the enquiry, order or product specification, the inspection document/certificate issued with the casting shall be in accordance with EN 10204:2004 Type 3.1.

Marking, Packing and Shipping:

36. SSA shall mark all cast products with:
 - a. Heat charge no.
 - b. Test no.
 - c. Work Order/Serial No.
 - d. Material Designation
 - e. Other markings requested by the Purchaser.
37. Packaging and/or surface protection shall be at SSA's discretion, unless otherwise specified in the enquiry, order, or product specification.