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Brazing Procedure Specifications (BPS) and ISO 17779:2021 Overview

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Agenda Overview



- Flame Brazing: Process, Applications, and Safety
- Induction Brazing: Technology, Process, and Safety
- Furnace Brazing: Controlled Atmospheres and Process Management
- Special Brazing Processes: Techniques and Applications



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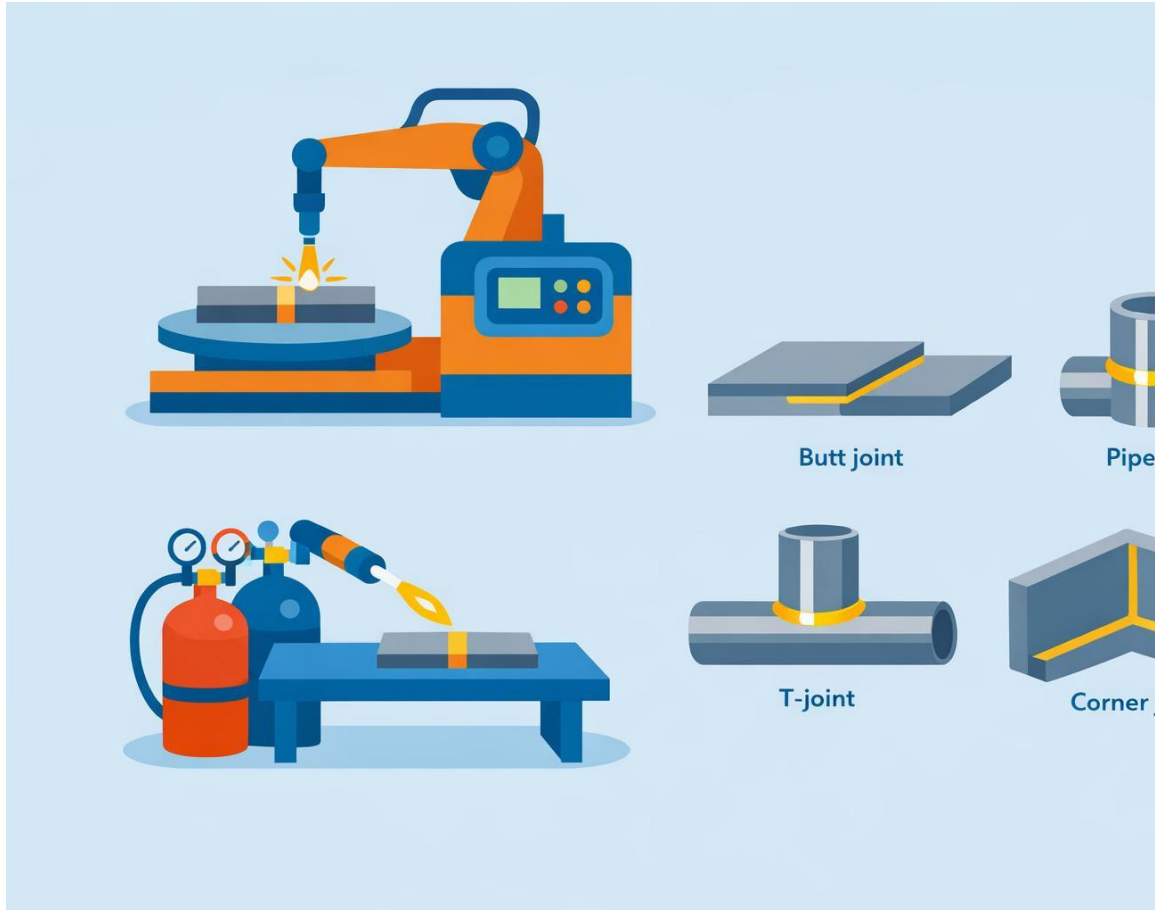


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Scope and Application of ISO 17779:2021

Requirements and exclusions of ISO 17779:2021



Brazing Procedure Specification

ISO 17779:2021 defines requirements for specifying and qualifying brazing procedures for joining metals.

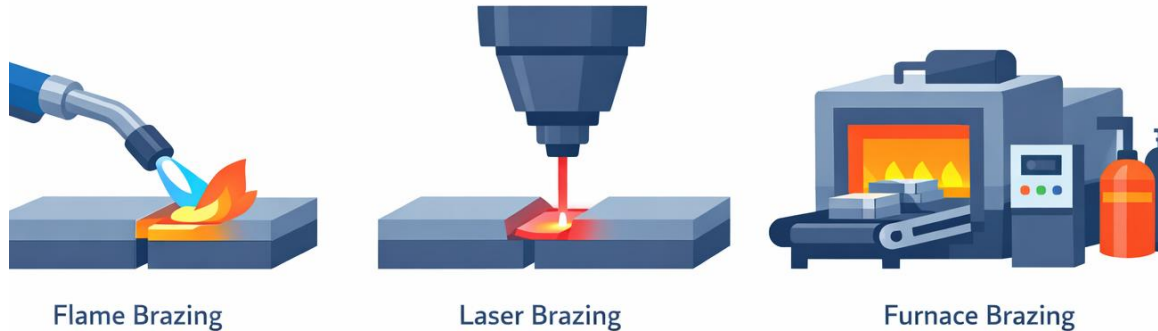
Scope of Brazing Methods

The standard covers multiple brazing methods including flame, laser beam, induction, vacuum, and arc weld brazing.

Exclusions in the Standard

ISO 17779:2021 excludes aerospace brazing procedures and testing for residual stresses, corrosion, or impact properties.

Range of applicable brazing processes



Scope of ISO 17779:2021

The standard defines requirements for specifying and qualifying brazing procedures for metallic material joining.

Quality and Testing Guidelines

It covers procedures for test pieces, essential variables, acceptance criteria, and quality requirements in brazing.

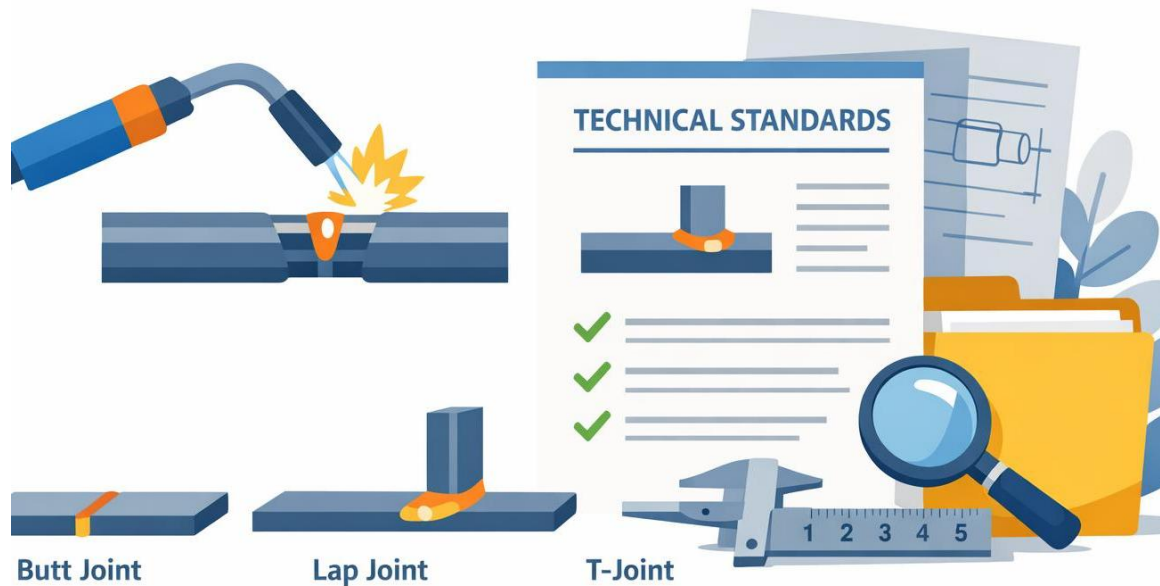
Applicable Brazing Methods

Includes infrared, flame, laser beam, electron beam, induction, furnace, vacuum, dip-bath, arc weld and more.

Exclusions and Extensions

Standard excludes aerospace brazing procedures but may apply to other unspecified processes and materials.

Aerospace application exclusions and references



Scope of ISO 17779:2021

ISO 17779:2021 specifies requirements for brazing procedure qualification and specification for joining metallic materials.

Excluded Testing Areas

The standard does not cover testing for residual stresses, corrosion resistance, or impact properties in brazed joints.

Applicable Brazing Methods

Includes various brazing methods like laser beam, induction, vacuum, dip-bath, arc weld brazing, and more as per ISO 857-2 and ISO 4063:2009.

Aerospace Application Exclusion

Aerospace brazing procedures are excluded and are governed by ISO 11745 standard separately.



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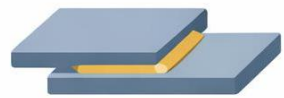


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Preparation and Testing of Brazed Joints

Test piece preparation, joint design, and requirements



Lap Joint



Butt Joint



Sleeve Joint

Joint Design Types

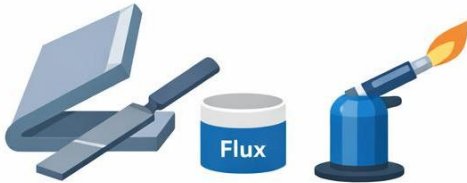
Test pieces usually include lap, butt, or sleeve joints to represent typical brazing production designs.

Test Piece Preparation

Test pieces must be prepared and brazed under production-like conditions following the preliminary Brazing Procedure Specification.

Testing and Witnessing

Brazing and subsequent testing must be witnessed by qualified examiners to ensure compliance with standards.



Brazing Preparation



Brazed Joint Testing

Visual examples of test piece configurations

Lap Joint Configuration

The lap joint involves overlapping two pieces and is commonly used in mechanical tests for strength evaluation.

Butt Joint Configuration

The butt joint connects two pieces end-to-end and is tested for tensile strength and weld quality.

Simple Lap Joint

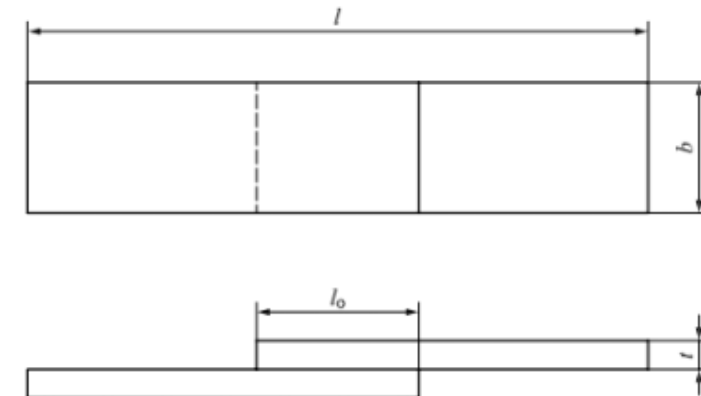
The simple lap joint is a basic form of lap joint with minimal overlaps, used for straightforward strength testing.

Multiple Joints Configuration

Multiple joints configuration combines several joint types or repetitions to assess complex mechanical behavior.

T-Joint Configuration

The T-joint connects two pieces perpendicular to each other forming a 'T' shape, commonly tested for shear and tensile strength.



Key
 b width
 l total length
 t thickness
 l_o overlap length

Examination and testing procedures and standards



Compliance with Standards

Testing of brazed joints must comply with EN 12797 and EN 12799 standards for reliable quality assessment.

Non-Destructive Testing

Non-destructive tests such as visual inspection and radiographic testing should be conducted before specimen cutting.

Destructive Testing Procedures

Destructive tests include bend, peel, shear, and tensile testing as specified for different joint surfaces and configurations.

Test Specimen Requirements

Specimens must conform to shapes and sizes specified in standards or agreed by contracting parties to ensure valid test results.

Table of examination and testing requirements

Test piece	Type of test	Extent of testing
T-joint	Visual, and Metallographic, or Bend	100 % 2 sections ^a 2 specimens ^b
Lap joint	Visual, and Metallographic, and Shear, or Peel	100 % 2 sections ^a 2 specimens 2 specimens
Butt joint	Visual, and Metallographic, and Tensile, or Bend	100 % 2 sections ^a 2 specimens 2 specimens ^b
^a Normally, macro sections are sufficient. However, micro sections can be required.		
^b One first surface and one second surface test.		



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Acceptance Criteria, Retesting, and Qualification Variables

Acceptance criteria for imperfections and retesting protocols

Testing Brazen Joints



Initial Inspection



Testing Methods



Pass: Approved



Fail: Retesting Required



Documentation



Training & Safety

Acceptance Criteria Standards

Imperfections must meet ISO 18279:2003 quality levels for brazing procedure qualification.

Quality Levels for Imperfections

Quality level B applies generally; excess braze metal requires quality level C compliance.

Retesting Protocols

Failed tests allow one retest; destructive test failures require up to two additional specimens.

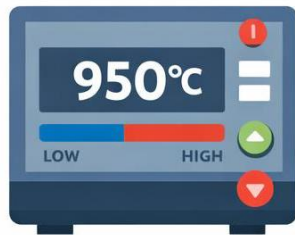
Failure Implications

If retests fail, the brazing procedure qualification is not successful.

Essential variables and range of qualification



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TEMPERATURE CONTROL



Qualification Requirements

All specified conditions must be met for compliance; changes outside ranges need new qualification testing.

Brazing Process Consistency

Brazing temperature and furnace atmosphere must stay within BPS ranges and consistent with qualification tests.

BPS Documentation Details

BPS must include comprehensive instructions, materials, joint design, brazing process, and cleaning methods.

Essential Variables



- Identification of the manufacturer
- Identification of the BPS
- Reference to the brazing procedure qualification record (BPQR) or other required documents
- Parent material designation and reference standard(s), and material group in accordance with Annex E
- Dimensions of the parent material (thickness and pipe outside diameter)
- Joint design/configuration sketch containing all relevant dimensions, such as overlap length and gap
- Brazing process
- Brazing filler material flow direction
- Brazing filler material designation and reference standard(s)
- Brazing filler material type

Essential Variables



- Brazing filler material application
- Brazing flux designation and reference standard(s), and trade name
- Brazing flux type
- Fuel gas designation or composition, and gas flow
- Brazing temperature
- Furnace atmosphere
- Post-braze heat treatment in relation to transformation temperature
- Method of preparation and cleaning of the joint before and after brazing
- Degree of mechanization (manual, mechanized, automatic)

BPS reference No.:	
Manufacturer's name and address:	
Manufacturer's brazing procedure (BPQR No.):	

Brazing process:		Method of joint preparation:	
Joint type:		Material thickness (mm):	
Parent material(s) and specification(s):		Outside diameter (mm):	
Degree of mechanization: (manual/mechanized/automatic)		Brazing position:	
Gap (mm):		Overlap, L (mm):	

Joint design and preparation details (sketch):

Brazing filler metal type and specification:		Method of pre-braze cleaning:	
Brazing filler metal form:		Method of post-braze cleaning:	
Method of filler metal supply:		Nozzle size and number:	
Flux type and specification:		Heating gas type:	
Flux form:		Heating gas pressure:	
Method of flux supply:		Preheat temperature:	
Jig/fixture details:		Post-braze heat treatment:	

Manufacturer's representative Name, date and signature:	Examiner/Examining body Name, date and signature: