

# PARTICULAR TECHNICAL SPECIFICATIONS



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## Structural Stainless Steel

All works shall conform to relevant Indian standards in the absence of equivalent Indian Standard following codes shall be followed:

ENV 1993-1-1 *Design of steel structures: General rules and rules for buildings*

ENV 1993-1-2 *Design of steel structures: Structural fire design*

ENV 1993-1-3 *Design of steel structures: Cold-formed thin gauge members and sheeting*

ENV 1993-1-4 *Design of steel structures: Stainless steels*

ENV 1993-1-5 *Design of steel structures: Plated structural elements*

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EN 1993-1-4 *Design of steel structures: Stainless steels*

EN 1993-1-5 *Design of steel structures: Plated structural elements*

EN 1993-1-8 *Design of steel structures: Design of joints*

EN 1993-1-9 *Design of steel structures: Fatigue strength of steel structures*

EN 1993-1-10 *Design of steel structures: Selection of materials for fracture toughness  
And through thickness properties*

## Material grades

The material shall be austenitic stainless steel of the grade 1.4301 (widely known as 304) it shall contain 17-18% chromium and 8-11% nickel.

### Mechanical properties of Austenitic Steel

	Grade	Product form <sup>(1)</sup>	Max thickness (mm)	Minimum 0.2% proof strength <sup>(2)</sup> (N/mm <sup>2</sup> )	Ultimate tensile strength (N/mm <sup>2</sup> )	Elongation after fracture (%)
Basic chromium-nickel austenitic steels	1.4301	C	6	230	540 – 750	45 <sup>(3)</sup>
		H	12	210	520 – 720	45 <sup>(3)</sup>
		P	75	210	520 – 720	45
	1.4307	C	6	220	520 – 670	45
		H	12	200	520 – 670	45
		P	75	200	500 – 650	45

### Notes:

- (1) C = cold rolled strip, H = hot rolled strip, P = hot rolled plate
- (2) Transverse properties
- (3) For stretcher levelled material, the minimum values is 5% lower



### Chemical Composition

Grade	Content of alloying element (maximum or range permitted) weight %				
	C	Cr	Ni	Mo	Others
1.4301	0,07	17,0 - 19,5	8,0 - 10,5		
1.4307	0,03	17,5 - 19,5	8,0 - 10,0		
1.4401	0,07	16,5 - 18,5	10,0 - 13,0	2,0 - 2,5	
1.4404	0,03	16,5 - 18,5	10,0 - 13,0	2,0 - 2,5	
1.4541	0,08	17,0 - 19,0	9,0 - 12,0		Ti: 5xC - 0,7 <sup>m</sup>
1.4571	0,08	16,5 - 18,5	10,5 - 13,5	2,0 - 2,5	Ti: 5xC - 0,7 <sup>m</sup>

### Fasteners

Stainless steel fasteners shall be as given in EN ISO 3506, *Corrosion-resistant Stainless steel fasteners*. The specification gives chemical compositions and mechanical properties for fasteners in the austenitic. Alternative materials not specifically covered in the specification are permitted if they meet the physical and mechanical property requirements and have equivalent corrosion resistance.

### Minimum specified mechanical properties of austenitic grade fasteners to EN ISO 3506

Grade <sup>(1)</sup>	Property class	Thread diameter range	Bolts		Nuts
			Ultimate tensile strength <sup>(2)</sup> (N/mm <sup>2</sup> )	Stress at 0.2% permanent strain (N/mm <sup>2</sup> )	Proof load stress (N/mm <sup>2</sup> )
A1, A2, A3, A4 and A5	50	≤ M39	500	210	500
	70	≤ M24 <sup>(3)</sup>	700	450	700
	80	≤ M24 <sup>(3)</sup>	800	600	800

Notes:

- (1) In addition to the various steel types covered in EN ISO 3506 under property class 50, 70 and 80, other steel types to EN 10088-3 may also be used.
- (2) The tensile stress is calculated on the stress area.



## Chemical composition of fasteners to EN ISO 3506

Grade	Chemical composition (percentage weight) <sup>(1)</sup>								
	C	Cr	Ni	Mo	Si	Mn	P	S	Others
A1	0,12	16,0 - 18,0	5,0 - 10,0	0,7	1,0	6,5	0,20	0,15 - 0,35	
A2	0,1	15,0 - 20,0	8,0 - 19,0	<sup>(2)</sup>	1,0	2,0	0,05	0,03	
A3	0,08	17,0 - 19,0	9,0 - 12,0	<sup>(2)</sup>	1,0	2,0	0,045	0,03	Either Ti: ≥ 5xC - 0,8 Or Nb/Ta: ≥ 10xC - 1,0
A4	0,08	16,0 - 18,5	10,0 - 15,0	2,0 - 3,0	1,0	2,0	0,045	0,03	
A5	0,08	16,0 - 18,5	10,5 - 14,0	2,0 - 3,0	1,0	2,0	0,045	0,03	Either Ti: ≥ 5xC - 0,8 Or Nb/Ta: ≥ 10xC - 1,0

Note:

(1) Values are maxima unless indicated otherwise

## Finishes

All exposed stainless steel members shall have brush finish as per approved sample and type.

## Welded connections

Weld connection shall be made using correct procedures, including compatible consumables, with suitably qualified welders.

The contractor shall ensure the strength of the weld and to achieve a defined weld profile and shall also maintain corrosion resistance of the weld and surrounding material.

The following recommendations apply to full and partial penetration butt welds and to fillet welds made by an arc welding process such as:

Process number	Process name
111	Metal-arc welding with covered electrode (manual metal arc welding)
121	Submerged arc welding with wire electrode
122	Submerged arc welding with strip electrode
131	Metal-arc inert gas welding (MIG welding)



- 135 Metal-arc active gas welding (MAG welding)
- 137 Flux-cored wire metal-arc welding with inert gas shield
- 141 Tungsten inert gas welding (TIG welding)
- 15 Plasma arc welding

(Process numbers are as defined in EN ISO 4063.)

Compatible consumables should be used, such that the weld yield strength and Ultimate strengths exceed those of the parent material. Note that special consideration should be given to the case when a test value of the 0,2% proof stress is used as a basis of design .

The weld should be free from zinc, including that arising from galvanised products, and from copper and its alloys.

Welding deficiencies such as undercut, lack of penetration, weld spatter, slag and stray arc strikes are all potential sites and should thus be minimised.

Heat input and interpass temperatures need to be controlled to minimise distortion and to avoid potential metallurgical problems.

Welding should be carried out to an approved welding procedure according to a standard such as EN 288 *Specification and approval of welding procedures for metallic materials*, Part 2: *Welding procedure specification for arc welding*.

Welders should be approved in accordance with EN 287 *Approval testing of welders – Fusion welding*, Part 1: *Steels*.

### Consumables

All welding consumables should conform to the requirements specified in ENV 1090-6. It is important that consumables are kept free from contaminants and stored according to the manufacturer's instructions.

## FABRICATION ASPECTS

The precautions shall be taken at all stages of storing, handling and forming to minimize influences that jeopardize the formation of the self-repairing passive layer. Special care shall be taken to restore the full corrosion resistance of the welded zone.

The European Standard specification covering fabrication and erection of stainless steel structures is ENV 1090 *Execution of steel*, Part 6 *Supplementary rules for stainless steels* shall be followed.

### Storage and handling

- The steel should have a protective plastic or other coating. This should be left on as long as possible, removing it just before final fabrication.
- Storage racks should not have carbon steel rubbing surfaces and should, therefore, be protected by wooden, rubber or plastic battens or sheaths. Sheets and plates should preferably be stacked vertically.
- Contact with chemicals including undue amounts of oils and greases (which may stain some finishes) should be avoided.
- Independent fabrication areas for stainless steel should be used.

Only tools dedicated to stainless steel should be employed (this particularly applies to grinding wheels and wire brushes). Note that wire brushes and wire wool should be of stainless steel and generally in a grade that is equivalent in terms of corrosion resistance (e.g. do not use ferritic stainless steel brushes on austenitic stainless steel).



# GENERAL TECHNICAL SPECIFICATIONS



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All works shall be executed, measured and paid for as per latest CPWD specification with up-to date correction slips, unless otherwise provided in the agreement.

The tenderers are requested to obtain the copies of the above documents directly as these specifications /documents are not being issued along-with the tender documents. These specifications/ published documents with up-to date correction slips will form part of the contract agreement to be executed with the successful tenderer.

For the item not covered in the CPWD or Particular Technical Specifications, the work shall be executed as per latest relevant standard codes published by BIS(formerly ISI) inclusive of all amendments issued thereto or revision, if any, up-to the date of opening of tenders.

In case of BIS codes specifications are not available the decision of the Engineer based on acceptable sound engineering practice and local usage shall be final and binding on the contractor.

The contractor shall assure adherence to the quality and any testing required will be carried to the satisfaction of Engineer before acceptance of material, workmanship etc at the workshop/factory where components are manufactured/ fabricated or at site as per directions of Engineer in Charge

