



**GENERAL TECHNICAL
SPECIFICATION FOR
STEEL PURCHASING OF PARSAN**

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Distribution : PSD, TLD, URD, STN, KLT, LAB,

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Yetkili imzalar orijinal dosyada muhafaza edilmektedir. Elektronik ortamda imzasız geçerlidir.



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This General Technical Specification for Steel Purchasing of Parsan can only be applied to the Steel Makers / Sellers which have been approved by Parsan or the Customers of Parsan.

The priorities (validities) sequence, to be taken into account by the Steel Maker, in steel orders are outlined below:

- 1- The special instructions / definitions of the Purchasing Department of Parsan for that specific order. (Purchase order for the specific steel grade)
- 2- The Individual Special Specification on the steel grade basis.
- 3- The Customer Specification for that steel grade.
- 4- The Parsan's General Technical Specification for Steels.

1. SCOPE

This specification outlines / covers general requirements and applications for “Forging Quality Steel” supplied as round bars or square bars made from ingot and strand cast from sellers / manufacturers of steel to Parsan.



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2. STEELMAKING REQUIREMENTS

This article covers the application of separate ladle refining techniques for improvement of steel cleanliness and steel manufacturing methods.

2.1. Steel should be manufactured by Mill, either ways of steel manufacturing methods as shown below:

- I. Basic Open Heart,
- II. Basic Electric Arc,
- III. Basic Oxygen (L.D.) Process
- IV. Electroslag / Vacuum Arc – Remelting

2.2. Production of clean and good quality steel requires acceptable casting technology.

- I. Clean Steel means steel quality without oxygen, sulfur and the composition of these 2 elements.
- II. Good quality steel means homogeneous, fully killed fine grained steel quality without crack, porous structure and segregation.

2.3. Sequence casting of multiple heats of strand cast steel is permitted with the following restrictions:

- I. Sequence casting shall only be done with heats of similar grade and carbon range steels. The boron steels can not be sequence cast with non-boron steels.
- II. A reliable method must be employed to identify the transition material between heats according to the following:
 - a. If the (DI) ratio for the two heats is between 0.80 – 1.20 the transition metal may be assigned to either heat, provided that both fulfill the specified composition and hardenability requirements.



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- b. If the (DI) ratios of the two heats is not between 0.80 – 1.20 and both heats satisfy specification requirements for chemistry and hardenability, extra testing must be done on the transition material to determine which billets / blooms can be assigned to either heat.

3. THE CHEMICAL COMPOSITION

- 3.1.** The Chemical Composition Limits must conform to the steel specification. The Carbon Content only might deviate ± 0.01 % from the steel specification carbon limits.
- 3.2.** Unless otherwise specified, the sulfur level for all steels furnished to this specification, shall be 0.010 % minimum.
- 3.3.** Unless otherwise specified, incidental elements (Ni, Cr, Mo, Cu, V and Sn)., which are not specified or required, shall not exceed the amount given in the special (individual) Steel Specification and The Related National / International Steel Grade Standards (such as SAE, DIN, or BS)
- 3.4.** Oxygen content shall be determined for specified chemical analysis requirements by inert gas fusion method.
- 3.5.** Boron steel, furnished to this specification must be produced by a reliable steelmaking practice that must include sufficient quantities of elements (max. 0.06 % Ti) to form “effective boron” by protecting the boron from reaction with nitrogen.
Unless otherwise specified in special (individual) Steel Specification, maximum permissible Sn content is 0.025 %



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3.6. The Grain Refining Treatment should be carried out with aluminium only, if the special (individual) Steel Specification does not require this treatment with Nb, V, Ti. The normal (usual) range of Aluminium Content for grain refining purpose should be 0.020 – 0.050 %.

4. STEEL QUALITY REQUIREMENTS

4.A. Ingot Cast Quality Steel

Ingot Cast quality steel billet made from Ingot produced for hot forging applications require the manufacturing control practice of, chemical composition / deoxidation / molding / pouring / discard / cooling / scarfing / surface quality / testing to achieve the degree of internal soundness, uniformity of chemical composition and freedom from surface imperfection.

If not otherwise specified in the “special (individual) Steel Specification” the quality of steels shall conform the related norms and the requirements in subsequent articles.

4.A / 1 Forgeability Test

Five (5) different samples have to be taken out from 5 different individual bar / billet. After tests have been done according to Appendix “A”, no fissure split crack and burst, blow-up should be seen on each sample, otherwise the steel would be rejected.

4.A / 2 Blue Fracture Test

Test has to be made in accordance with S.E.P 1584 / 1970. Six (6) different samples should be taken out from six (6) different bar / billet. If not otherwise specified, the maximum rating of two (2) is valid.

4.A / 3 Macro Etch Test

It is the inspection for determining the state of the tissue of the steel and it should be carried out with ASTM E 381. If not otherwise specified, the maximum ratings of S2, R2 and C3 are valid for billets produced from ingot cast steel.



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4.A / 4 Microcleanliness Test

Microinclusion

If not otherwise specified or required, the test for detecting and measuring the microinclusions in the steel, shall be carried out according to ASTM E 45 or DIN 50602.

According to ASTM E 45, Maximum Inclusion Limits :

A	B	C	D
3.0T - 2.0H	2.5T - 1.5H	2.5T - 1.5H	2.0T - 1.0H

According to DIN 50602, Maximum Inclusion Limits, as per steel bar size shall be :

35 – 70mm : K4<20
70 – 120mm : K4<25

4.A / 5 Grain Size

If not otherwise specified or requested by “Special (individual) Specification”, the steel austenitic grain size should be five (5) or finer according to ASTM E 112 (MCQUAID – EHN) using material produced as late in the heat as possible. Aluminum must be used for grain refining practice unless other grain refining elements (Nb, V or Ti) are specifically listed in the steel specification.

For the steel specifications where Al, Nb, V, or Ti are specified for grain refining practice, it should be satisfied that:

- Aluminum content is 0.02 % or greater, or
- Vanadium content is 0.06 % or greater, or
- Titanium content is 0.02 % or greater, or
- Niobium content is 0.03 % or greater.

4.A / 6 The Banded Structure

The Banded Structure in steel can not be accepted as indicated in the Appendix D



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4.A / 7 Hardenability Requirements

4.A / 7.1 Hardenability Test

If not otherwise specified in the Special (individual) Steel Specification the Hardenability Test has to be carried out by the Steel Maker according to DIN 50191 or ASTM A 255

4.A / 7.2 The Ideal Diameter Calculation for Hardenability

When the special (individual) Steel Specification requires calculation of the Ideal Diameter (I.D.) ; the calculation shall be made according to SAE J406 This calculation shall use carbon, manganese, silicon, nickel, chromium, molybdenum, copper and vanadium. Steel Grades specifying the Calculated – DI shall not contain hardenability intensifiers such as Boron (B) .

4.A / 8 Tests for Mechanical Properties

If not otherwise specified in the special (individual) Steel Specification, sampling for mechanical properties tests (where from the samples shall be taken) shall be carried out according to EN 10083 / 1 –2.

The tests for mechanical properties shall be carried out according to DIN 50125 or ASTM E8.

The Charpy Test shall be carried out according to DIN 50115.

4.B. Strand Cast Quality Steel

This article covers The Reduction Ratio and Internal Quality of Strand Cast Steel for hot forging applications.

4.B / 1 Reduction Ratio of Strand Cast Steel

The Reduction Ratio of the rolled steel (made out from Strand Cast Steel) is the ratio of original As Cast Cross Sectional Area to the final rolled steel cross sectional area.

The reduction ratio shall be indicated in the Steel Purchase Order of Parsan.

4.B / 2 Internal Quality and Sampling of Strand Cast Quality Steel

The sampling of the Strand Cast Steel shall be carried out in 2 (two) stages; namely

a) Sampling from As Cast Size Strand:

Minimum 1 sample at the beginning of the heat

Minimum 1 sample at the end of the heat.

b) Sampling from Rolled Size Bar / Billet :

Minimum 2 samples

The samples in a) and b) shall be taken and shall be prepared and examined according to ASTM E 381 Standard

The Macroinclusion Levels according to ASTM E 381 shall be S2, R2, C3.



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4.B / 3 All The Other Tests

All the other tests for this quality steel shall be carried out same as the ingot quality steel.

4.C. Torsion Bar Quality Steel

This article covers the Torsion Bar Quality Steel for round steel bars. As the result of product – design requirements and product-manufacturing requirements, it is necessary to minimize the presence of injurious imperfections and inclusions on surface and sub-surface of the round steel bars; through the use of special rolling practice, special bar and billet conditioning and selective inspection.

Therefore Magnaflux Inspection Method is the determining factor for round steel bars to be used for manufacturing of the critical or Highly Stressed Parts (end products) such as Torsion Bars.

4.C / 1 Application of AMS 2301 for Determining Surface and Sub-Surface Inclusions.

If not otherwise specified or requested in the special (individual) Steel Specification all of the round steel bars should be inspected to determine the inclusions according to the method AMS 2301.

The minimum Stock Removal as the initial stage of sample preparation for magnaflux inspection as per AMS 2301, are shown in Appendix – B.

4.C / 2 Sampling

At least six (6) samples having 200mm length have to be taken from six (6) different steel bars.

4.C / 3 Evulation of Inclusions

Unless otherwise specified, the evaluation of inclusions results shall not exceed the following maximum limits.

In the basis of individual test bar evaluation (1 / inch ²)			
Bar Diameter (mm)	%C	Frequency	Severity
< 63.5	< 0.25	1.10	1.05
	≥ 0.25	1.00	0.95
≥ 63.5	< 0.25	0.80	0.80
	≥ 0.25	0.80	0.67



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In the basis of average of all test bars in a heat (1 / inch ²)			
Bar Diameter (mm)	%C	Frequency	Severity
25.4 - 63.5	< 0.25	0.90	0.85
	≥ 0.25	0.85	0.80
63.5 – 101.6	< 0.25	0.60	0.55
	≥ 0.25	0.55	0.50
≥ 101.6	< 0.25	0.37	0.28
	≥ 0.25	0.34	0.25

4.C / 4 All The Other Tests

All the other tests for this quality steel, shall be carried out same as the ingot quality steel.

4.D. The Special (individual) Steel Specification of Parsan.

The Special (individual) Steel Specification of Parsan , indicates The Special Requirements on Steel Grade Basis and takes precedence against This General Technical Specification for Steel Purchasing of Parsan.

For the other requirements which are not indicated / covered by the Special (individual) Steel Specification, This General Technical Specification for Steel Purchasing of Parsan is valid.

4.D / 1 The Modifications in the Special (individual) Steel Specification of Parsan.

Parsan may / can make The Modifications (on Chemical Composition, Hardenability, etc.) in the Special (individual) Specification.

Therefore the Steel Maker must obey (take in to consideration) The Modifications made by Parsan.

4.D / 2 The Latest Revision Status of The Special (individual) Steel Specification of Parsan.

- Parsan has to send The Latest Revision of The Special (individual) Steel Specification to her steel suppliers.



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- The Steel Suppliers of Parsan have to pay attention to the Latest Revision of the Steel (individual) Steel Specification sent by Parsan.

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4.E. The other General Requirements for Steel Qualities in the articles 4.A, 4.B and 4.C.

For The Steel Qualities in Articles. 4.A (Ingot Quality Steel), 4.B (Strand Cast Quality Steel and 4.C (Torsion Bar Quality Steel), The following other General Requirements shall be taken into account by the Steel maker.

4.E / 1 Surface Quality

- This article covers the surface quality definitions for the billets and bars.
- Steels supplied according to this specification shall be free from harmful surface defects such as cracks, tears, pinholes or entrapped slag.
- Billet / bar surface may be conditioned by the methods of detecting rating improving (scarfing, pickling, magnaflux etc.) the surface defects provided that no defects are exposed in the process and the section dimensions conform to the specified tolerances.
- The maximum permitted thickness of total decarburization shall be up to max. 0.7 % of section (diameter or size) of the product. Determining of Decarburization Depth shall be carried out according to SAE J 419.
- The toleranced depth of any scratch on the surface cannot be more than maximum 0.3 mm. for the rolled round (bar) and square (billet) regardless of the section.

4.E / 2 Hardness, Structure and Heat Treatment

This article covers the as supplied conditions of billets and bars relating to hardness, structure and heat treatment features.

If not otherwise specified when ordering, the steel supplied shall be in “softened” condition for the purpose of providing optimum cold cropping features, which is valid for a size smaller than 120 mm. However, the subject material hardness cannot exceed the below indicated hardness limits.



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Up to 70mm = max. 255HBN (for cold cropping)

70 – 120mm = max. 235HBN (for cold cropping)

over 120mm = max. 285HBN (for saw cutting)

The expected microstructure of the material is partly spheroidized, dispersed perlite and ferrite.

4.E / 3 Mill Tolerances

This article describes mill tolerances for carbon and low alloy steel hot rolled products.

4.E / 3.1 Cross Section Tolerances

Cross section tolerances for round and round cornered square steel bars:

Specified Bar Size	General Application		Specific Application	
	Bar Size Tolerance	Ovality Tolerance for Round Bars	Bar Size Tolerance	Ovality Tolerance for Round Bars
mm	± mm	mm	± mm	mm
≤ 16	0.2	0.32	0.2	0.3
> 16 – 26	0.3	0.48	0.2	0.3
> 26 – 38	0.4	0.64	0.25	0.4
> 38 – 51	0.5	0.80	0.3	0.5
> 51 – 64	0.6	0.96	0.4	0.6
> 64 - 76	0.7	1.12	0.5	0.8
> 76 – 90	0.7	1.12		
> 90 – 120	0.8	1.28		
> 120 – 160	2.0	3.2		
> 160 – 200	2.5	4.0		
> 200	3.0	4.8		



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Ovality can not exceed, the %80 bar size tolerance

Ovality is the difference between the maximum and minimum dimensions of the product, measured at the same cross section.

4.E / 3. 2 Length Tolerances

1. Permissible variations in length of steel products are ± 50 mm. for the specified length.
2. The tolerance in length is not valid for one of eight bars.
3. The length of the steel bar portion, which has been deformed by the cropper in steel mill, can not exceed the diameter / size of the bar..

4.E / 3.3 Straightness Tolerances

Permissible variations in straightness:

- Standard tolerance, which is valid for square bars, is 1 / 250 in any 1.5 meter length of bar.($0.004 \times 1500 = 6\text{mm}$)
- Special tolerance, which is valid for round bars, is 1 / 400 in any 1.5 meter length of bar.($0.0025 \times 1500 = 3.75\text{mm}$)

Departure from straightness is measured by placing the bar on a level table so that depth of arc is checked with a filler gage and a straightedge.

4.E / 4 Radioactive Test on the Scrap

Radioactive Test to be carried out on the scrap to be used for making the required / ordered steel.

The Mill Certificate shall state that the radioactive test on the scrap used for making the steel ordered, has been carried out and that scrap does not contain any radioactivity.



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4.E / 5 Ultrasonic Inspection for Internal Soundness of Steel

All the steel bars / billets shall be Ultrasonic Tested for internal soundness of the steel according to SEP 1920 - Claas C.

This test shall be stated in the Mill Certificate.

4.E / 6 Magnetic Particle Inspection and Residual Magnetism.

All the steel bars / billets shall be Magnetic Particle Inspected.

This test shall be stated in the Mill Certificate.

After Magnetic Particle Inspection the Residual Magnetism on the steel bars / billets shall not exceed ± 5 Gauss.

4.E / 7 Anti Mixing Spectral Test.

Anti Mixing Spectral Test on all the bars / billets shall be carried out, to verify that there is no mixing of different heats of same steel grade and different steel grades in the subject heat of steel to be shipped.

This test shall be stated in the Mill Certificate.

5. SAMPLING PROCEDURES

5.A Sampling Locations

The Samples from the steel bar / billets shall be taken by the steel maker from the sample locations according to EN 10083 / 1 - 2 Standards.

5.B The Quantities of the Samples

The Steel maker shall take the following quantities of samples for below indicated tests :

- One (1) sample for Chemical Composition Test
- Two (2) samples for Tensile Test
- Two (2) samples for Hardenability Test
- Three (3) samples for Charpy Test



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6. CLASSIFICATION OF STRAND CASTER

This section covers requirements for evaluation and classification of strand cast facilities. The quality of the cast product is a function of both equipment and process controls. These factors must be considered in the procurement of strand cast steel. Following is a list of key points to be used to define the class or quality capability of the Strand Caster of “Class 2.”

6.A / Class 2 – Caster shall have the following characteristics.

1. Either a submerged ceramic or a gaseous shroud is required from the ladle to the tundish. Adequate sealing is required at all shrouding couplings to prevent air aspiration.

2. Either a submerged ceramic or a gaseous shroud is required from the tundish to the mold. For gaseous shroud systems, the oxygen level in the vicinity of the molten stream must be monitored and should be maintained at 0.5 % or less. Adequate systems must be in place to assure that the variables associated with the operation of gaseous shrouds are being consistently controlled.

3. The size and design of the tundish should be adequate to consistently produce material meeting the quality requirements of this specification. The tundish should be fully enclosed with positive inert gas pressure or it should have a slag cover at all times.

4. Ladle stirring (prior to casting) is required for chemical homogeneity, uniformity of temperature and promote flotation of inclusions.

7. DATA SUBMISSION (Submission of Mill Certificate)

7.A. Compliance to the Requirements.

Unless otherwise permitted, compliance with specification requirements shall be based on the



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qualities of individual samples, but not average qualities of a group of samples and test / analysis results of the samples, shall be indicated in the Mill certificate to be sent to Parsan Metallurgical Laboratory.

7.B. Acceptance or Rejection of the steel delivered to Parsan

The Metallurgical Division of Parsan (Parsan Metallurgical Laboratory) may accept or reject the steel, based on the results of the Mill Certificate of the steel supplier. Or Parsan Metallurgical Laboratory may carry out the tests on the steel despite the Mill Certificate of the steel supplier and may accept or reject the steel based on her own test results.

7.C. Retaining of the Samples by The Steel Maker.

Sample material shall be retained by the supplier for a period not less than 120 days following the submission date of the test results to Parsan.

7.D. Sending the Mill Certificate

The Mill Certificate arranged by steel supplier has to be sent with the consignment (shipment) to Parsan Metallurgical Laboratory.

7.E. Final Statement in the Mill Certificate

In the mill certificate, the steel manufacturer shall confirm the consistency that the steel has been produced and tested in accordance to ordering specifications and states the confirmation of the test conditions to the norm of EN 10204 – 3.1 B as in writing.

7.F. The Transmission of All The Heat Data and Samples to Parsan (if required).

Suppliers shall certificate / transmit all heat data and samples (if required), which are pointed in the General Technical Specification and the Special (individual) Steel Specification to Parsan Metallurgical Laboratory.



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7.G. Indicating the Results of All The Tests on the Mill Certificate

The Steel Supplier shall indicate on the Mill Certificate the results of All the Tests given in this General Technical Specification and in the Special (individual) Steel Specification.

The test results of the following Chemical Elements shall be indicated by the steel maker on the Mill Certificate: C, Si, Mn, P, S, Cr, Mo, Ni, Al, Cu, Sn, V, Ti, Nb, O, H, N, and B (for Boron Steel only)

8. MARKING, PROTECTING, PACKAGING, LABELING, and SHIPPING

8.A. When steel purchased by Parsan is shipped, the steel supplier shall identify the steel quality as ingot cast steel or strand cast steel together with Reduction Ratio on the Mill Certificate.

8.B. The steel products have to be shipped in bundles of 2500 kg. maximum weight.

8.C. If not otherwise specified, the steel bars / billets length shall be 4 – 6 mt. and all bars / billets have to be in the same length.

8.D. All the bars / billets of the bundle have to be lined exactly (zero end) on one side.

8.E. Parsan may require Length of Bars / Billets either in a fixed length or in different lengths in one shipment.

8.F. Parsan may require different cross sections of bars / billets in one shipment.

8.G. Peeled Steel can only be shipped after being protected against corrosion by oiling on the surface with anti corrosion oil plus protective packaging .

For Peeled – Off Round Steel Bar Orders Parsan’s Technical Specification For Peeling Steel Bars (Document Nr.PSE-010.05) shall be additionally applied.



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- 8.H.** With the numerator, at last three digits of the heat number have to be marked on the forehead of each bar / billet that is over 45 mm. in size.
- 8.I.** The label carrying the whole Heat Number shall be stuck to the forehead of each steel bar / billet having the size less than 45mm.
- 8.J.** Each bundle of steel should be bandaged with packing steel belts or wires at minimum four locations properly.
- 8.K.** Each steel bar / billet bundle has to have an identical label attached on, which indicates (evidences) the grade, size, whole heat number and weight of the steel and the steel maker.
- 8.L.** The Steel Bar / Billet Bundles, have to be supported at least three point in the track position for easy handling and to prevent warping of products.

9. QUALITY RESPONSIBILITY of THE STEEL PRODUCED for PARSAN

- 9.A** The Quality Responsibility of The Steel Produced and Shipped to Parsan, belongs to the Steel Producer (maker).
- 9.B.** The fulfillment of this specification for such material in no sense constitutes approval of, or obligation of Parsan to use any material, which may later exhibit improper quality.
- 9.C.** Prior to implementation, steel producer shall review any significant change of quality control procedure with the Purchasing Department and Metallurgical Laboratory of Parsan.
- 9.D.** Final testing, acceptance and rejection of steel shall be prerogative of Parsan.
- 9.E.** Parsan's General Technical specification for Steel Purchasing is valid together with the Special (individual) Steel Specification of Parsan



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9.F. Final application of a mill heat to Parsan orders shall include only that portion of a heat that confirms within the extremes represented by the samples or test data approved by Parsan.

9.G. For the requirements properties / limits / tests etc. are not defined in the Special (individual) Steel Specification, the requirements in The General Technical Specification for steel purchasing of Parsan and The Related National / International Steel Standards (such as BS, SAE, ASTM, DIN etc.) are valid.

9.H. The User (Parsan) has the right to test the subject steel together with The Steel maker.

9.I. The User (Parsan) has the right to inspect / to audit The Entire Steel Making / Rolling Facilities and Inspection / Test and The Laboratory Facilities of The Steel Maker at her premises.

10. OTHER REQUIREMENTS

10.A The Mill Certificate shall contain the following items:

- Parsan purchase order number.
- Strand Cast or Ingot cast
- Reduction Ratio if Strand cast.
- Heat Number
- Description of the commodity (steel) (steel Grade, size)
- Statement Result of % 100 Magnetic Particle Inspection,
- Statement Result of % 100 Ultrasonic Inspection
- Statement result of % 100 Anti Mixing Spectral Test.
- Statement result of Radioactive test on the Scrab used.
- The Contents in percentage of C, Si, Mn, P, S, Cr, Mo, Ni, Al, Cu, Sn, V, Ti, Nb,.
- The Contents in percentage of Zirconium, Calcium when intentionally added.
- Boron and Titanium when boron is specified.
- Oxygen, Hydrogen and Nitrogen (ppm) when specified or required.



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- When Charpy Impact test value is required, three (3) values and the average.
- When specified in the Special (individual) Steel Specification, mechanical properties such as tensile and yield strengths, % elongation, % reduction area.
- Hardenability results when specified or required.
- When required / specified in the Special (individual) Steel Specification, results of the following tests : forgeability, blue fracture, macro-etch, micro cleanliness, grain size, banded structure, surface and sub-surface inclusions as per AMS 2301, decarburisation.

10.B. Leaded steel is not normally permitted, in those cases where leaded steel is allowed; it will be specified with the use of the suffix “L”.

10.C. Boron steel furnished to this specification must be produced by a steel making practice, which includes sufficient quantities of titanium to form “effective boron” by protecting the boron from reaction with nitrogen. The requirements for titanium practice are waived if other nitride forming elements are used to provide “effective boron” in the product.(steel)

10.D. Heat records shall be maintained by The Steel Maker in a permanent file for 15 years and shall be adequate to demonstrate conformance to the specification.

10.E. Unless otherwise specified, **maximum total oxygen in the steel** as determined by inert gas fusion method shall be 25 parts per million.

10.F Maximum amount of Nitrogen in the steel shall be 70ppm and **maximum amount of Hydrogen** in the steel shall be 2ppm



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11. SUBJECT (related) NORMS / STANDARDS

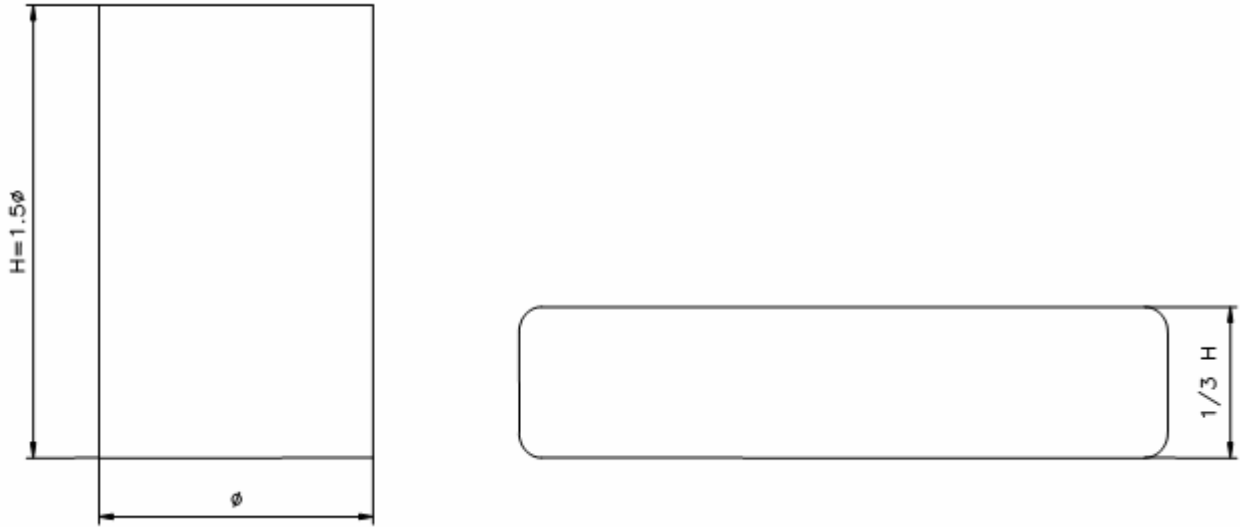
ASTM A 255	End Quench Test for Hardenability Of Steel
DIN 50191	End Quench Test for Hardenability Of Steel
ASTM A 370	Mechanical Testing of Steel Product
ASTM E 112	Estimating The Average Grain Size of Metals
ASTM E 350	Chemical Analysis of Carbon And Low Alloy Steel
ASTM E 381	Rating of Macroetched Steel
ASTM E 45	Determining The Inclusion Content of Steel
AMS 2301	Determining The Inclusion Content of Steel
SEP 1570-71	Determining The Inclusion Content of Steel
ASTM E 8	Tension Testing of Metallic Material
DIN 50125	Zugproben (Tensile Test)
ASTM E 10	Brinell Hardness Testing
DIN 50351	Brinell Hardness Testing
ASTM E 23	Notched Bar Impact Testing of Metallic Material
DIN 50115	Notched Bar Impact Testing of Metallic Material
S.E.P. 1584 / 70	Blue Fracture Test
SAE J 419	Determining of Decarburization
SAE J 406	The Calculation of Chemical Ideal Diameter
SEP 1920-21	Ultrasonic Testing
EN 10083 / 1-2	Quenched and Tempered Steels
PSE-010.05	<i>Parsan's Technical Specification for Peeling Steel Bars.</i>

APPENDIX A

This appendix covers the requirements for Forgeability Test.

The Test Piece consists of a cut part by sawing the rolled steel bar (round and square cross sectioned) to 1.5 times of its corroscut size (diameter).

The test piece has to be heated to be forged at 1100 – 1200C. The heated test piece should be forged by pressing or by hammering to 1/3 of its original length (height).



After forging, there should be no defects like fissure splits, cracks, bursts, below ups. Etc..

Steel Material Forged in this way (perfect), is acceptable as “forgeable”



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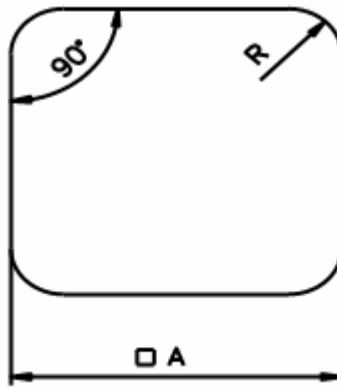
APPENDIX B

This appendix covers the minimum stock removal on round bars by machining for Magnaflux Quality Test of hot rolled steel bars fo Torsion Bar Quality.

HOT ROLLED SIZE (mm)	MIN.STOCK REMOVAL (mm)
Max. 12.70	0.76
12.70 – 19.05	1.14
19.05 – 25.40	1.52
25.40 – 38.10	1.90
38.10 – 50.80	2.29
50.80 – 63.50	3.18
63.50 – 88.90	3.96
88.90 – 114.3	4.75
114.3 – 152.4	6.35
152.4 – 190.5	7.92
190.5 – 228.6	9.52
228.6 – 254.0	11.1

APPENDIX C

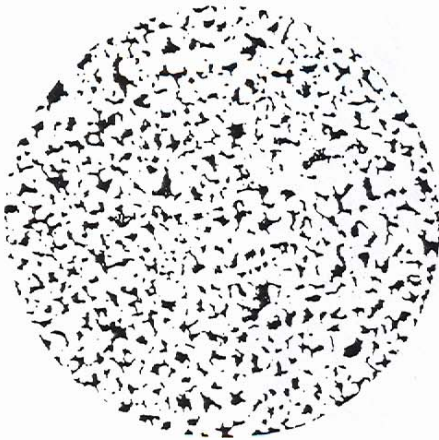
The requirements for **the corner radius-values**, of steel bars square sectioned according to cross-sections.



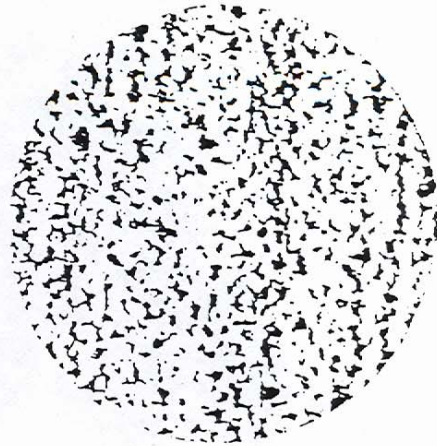
□ A: mm	R
50	7 - 10
55	7 - 10
60	9 - 12
65	9 - 12
70	11 - 13
75	13 - 15
80	13 - 15
85	14 - 17
90	14 - 17
95	15 - 18
100	15 - 18
105	16 - 20
110	16 - 20
> 110	> 20

APPENDIX D

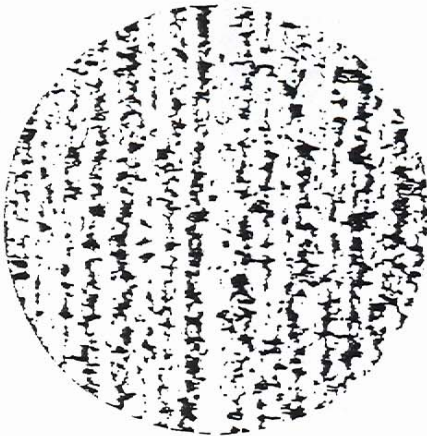
BANDING STRUCTURE CONTRACT FOR STEEL WHICH ARE,
ISOTHERMAL HEAT TREATED



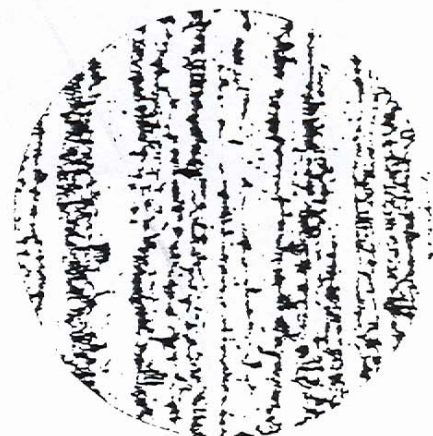
NR.1 ACCEPTED



NR.2 ACCEPTED



NR.3 ACCEPTED



NR.4 NOT ACCEPTED

BUT IT HAS TO BE COMPLAINT