1962

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September 1962

Fritz Engineering Laboratory Report No. 297.2

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This work has been carried out as part of an investigation sponsored jointly by the Welding Research Council and the Department of Navy with funds furnished by the following:

American Institute of Steel Construction
American Iron and Steel Institute
Institute of Research, Lehigh University
Column Research Council (Advisory)
Office of Naval Research (Contract No. 610(03))
Bureau of Ships
Bureau of Yards and Docks

Fritz Engineering Laboratory
Department of Civil Engineering
Lehigh University
Bethlehem, Pa.

Fritz Engineering Laboratory Report No. 297.2.

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C O N T E N T S

1. INTRODUCTION

As part of a projected research study a survey was made of all U.S. producers of rolled structural shapes. Manufacturers were asked what range of steel types they used in producing these shapes. This report is a summary of the findings of the survey. Twelve replies were obtained and the latest AISI Directory lists the producers replying as manufacturing 94% of the U.S. output.

The steels produced by these companies are listed below. Where a company's products are covered by ASTM specifications it may use the specification number as its sole designation. Other companies prefer to retain their tradenames.

The following lists are intended to give only an indication of available steels, they are not comprehensive lists of steel properties. These properties may be obtained from the references quoted for each steel. Only steels suitable for structural use have been considered, steels produced only in plates and/or bars have been specifically excluded. Thickness limitations have only been noted where they are less than 1-3/4".

The following identifications are used for those companies producing tradename steels:

BSC....Bethlehem
GLS....Great Lakes Steel
INL....Inland
J&L....Jones & Laughlin
KSC....Kaiser Steel Corporation
PSC....Phoenix Steel Corporation
USS....United States
WSC....Weirton Steel Company

The groupings used are:

GROUP I, The ASTM Recognized Steels, page 3.

GROUP II, Named Steels Similar to Group I, page 4.

GROUP III, Medium Range Steel (40 - 90 ksi), page 6.

GROUP IV, High Range (above 90 ksi) Heat Treated Alloy Steel, page 10.

Data on the Group I steels can be obtained from the latest ASTM Book of Standards, (Part I) or from the BSC Booklet 569 which reprints the relevant specifications. These steels are also the six structural steels approved by the 1961 AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

2. LISTING

GROUP I

THE ASTM RECOGNIZED STEELS

(1) ASTM A7

Originally issued for structures with riveted joints. No chemical or thickness requirements. 33 ksi yp. (1936).

(2) ASTM A373

Carbon (0.28%) and manganese (0.46-0.94%) controlled for weldability. 32 ksi yp. (1954).

(3) ASTM A36

Increased strength with weldability by controlling carbon (0.28%). 36 ksi yp. (1960).

(4) ASTM A440

Higher strength for non-welded structures. Carbon (0.28%) and manganese (1.60%). 50-42 ksi yp. (1959).

(5) ASTM A441

Higher strength for welded structures. Carbon (0.22%) and manganese (1.25%). 50-42 ksi yp. (1960).

(6) ASTM A242

Original high strength structural steel. Carbon (0.22%) and manganese (1.25%). Weldable in some instances. 50-42 ksi yp. (1941).

GROUP II

NAMED STEELS SIMILAR TO GROUP I

(7) BSC MAYARI-R

Meets ASTM A242, with higher corrosion resistance and fully weldable.

(8) USS COR-TEN

Meets ASTM A242. 50-46 ksi yp. 70-67 ksi uts. Weldable in all thicknesses. 19% elongation. Ref: ADUCO 02049.

(9) J&L COR-TEN

Meets ASTM A242. Under license with USS. 50-47 ksi yp. Up to 1-1/2" thick. Ref: AD-294B-561.

(10) INL HI-STEEL

Meets ASTM A242. 50 ksi yp. 70 ksi uts. Ref: Project 10-61-13M.

(11) GLS N-A-X HIGH TENSILE

Meets ASTM A242. 22% elongation. Up to 1/2" thick. Ref: N-A-X brochure. Shapes by order only.

(12) USS MAN-TEN (A440)

Meets ASTM A440. Ref: ADUCO 02042.

(13) INL HI-MAN (A440)

Meets ASTM A440. Ref: as for (10).

(14) USS TRI-TEN

Meets ASTM 441. Ref: ADUCO 02471.

(15) BSC-MEDIUM MANGANESE

Meets ASTM A440.

(16) BSC MANGANESE VANADIUM

Meets ASTM A441.

(47) PSC CLAYLOY

Meets ASTM A441.

(48) PSC PX50

Meets ASTM A242.

Note: There are also steels in Group III which may be modified to fit ASTM classifications. These steels are (28) and (32).

GROUP III

MEDIUM RANGE STEEL (40-90 ksi)

(17) BSC V45

45 ksi yp. 65 ksi uts. 18% elongation. Weldable.

C 0.22% Mn 1.25% Vanadium steel. Ref: BSC Booklet 1855.

(18) BSC V50

50 ksi yp. 70 ksi uts. 19-18% elongation. Weldable

C 0.22% Mn 1.25% Vanadium steel. Ref: as for (17).

(19) BSC V55

55 ksi yp. &0 ksi uts. 17-14% elongation. Weldable

C 0.22% Mn 1.25% Vanadium steel. Ref: as for (17).

(20) BSC V60

60 ksi yp. 75 ksi uts. 16-15% elongation. Weldable.

C 0.22% Mn 1.25% Vanadium steel. Ref: as for (17). 3/4" thickness

(21) BSC V65

65 ksi yp. 80 ksi uts. 15% elongation. Weldable.

C 0.22% Mn 1.25% Vanadium steel. Ref: as for (17). 3/8" thickness

(22) USS MAN-TEN

50-40 ksi yp. 75-65 ksi uts. 20-22% elongation. Weld

with care. C 0.25%. Mn 1.10-1.16%. Ref: ADUCO 02042.

(23) USS EX-TEN

45 ksi yp. 60 ksi uts. 19% elongation. Weldable.

Up to 3/8" thick. Columbium steel. Ref: ADUCO 02051.

(24) USS EX-TEN 50

50 ksi yp. 65 ksi uts. 18% elongation. Weldable. Up to 3/8" thick, Columbium steel. Ref: as for (23).

(25) J&L JLX-45-W

45 ksi yp. 60 ksi uts. 24% elongation. Weldable. Columbium steel. C 0.20%. Up to 5/16" thick. Ref: AD-295-6-61.

(26) J&L JLX-50-W

50 ksi yp. 65 ksi uts. 22% elongation. Weldable. Columbium steel. C 0.20%. Up to 5/16" thick. Ref: as for (25).

(27) J&L JLX-55-W

55 ksi yp. 70 ksi uts. 20% elongation. Weldable. Columbium steel. C 0.20%. Up to 5/16" thick. Ref: as for (25).

(28) J&L JLX-60-W

60 ksi yp. 75 ksi uts. 18% elongation. Weldable. Columbium steel. C 0.20%. Up to 5/16"thick. Ref: as for (25).

(29) J&L Ni-Cu-Ti

50-47 ksi yp. 70-65 ksi uts. 22% elongation. Weldable. C 0.15% Mn 1.00%. Up to 1-1/2" thick. Cam be modified to meet ASTM A242. Ref: AD-296-6-61.

(30) J&L JALTEN #1

50 ksi yp. 70 ksi uts. 22% elongation. Weldable. C 0.22%. Mn 1.25%. V.07%.

(31) J&L JALTEN # 3R

50 ksi yp. 70 ksi uts. 22% elongation. Weld with care. C 0.25%. Mn 1.60%, (semi-killed).

(32) J&L JALTEN # 3S

50 ksi yp. 70 ksi uts. 22% elongation. Weld with care. C 0.25%, Mn 1.60% (Fully killed-more uniformity).

(33) INL TRI-STEEL

50-42 ksi yp. 70-63 ksi uts. 22-24% elongation. Weldable. C 0.22%. Mn 1.25%. Can be modified to meet ASTM A242, and A441. Ref: Project 10-61-13M.

(34) INL HI-MAN

50-40 ksi yp. 75-65 ksi uts. 18-19% elongation. Weld with care. C 0.25%. Mn 1.10-1.60%. Ref: as for (33).

(35) INL INX-45

45 ksi yp. 60 ksi uts. 18% elongation. Weldable. Columbium steel, up to 3/8" thick. C 0.20%. Ref: 54-61-15M.

(36) INL INX-50

50 ksi yp. 65 ksi uts. 16% elongation. Weldable. Columbium steel, up to 3/8" thick. C 0.22%. Ref: as for (35).

(37) INL INX-55

55 ksi yp. 70 ksi uts. 14% elongation. Weldable Columbium steel. Up to 3/8" thick. C 0.24%.

Ref: as for (35).

(38) INL INX-60

60 ksi yp. 75 ksi uts. 12% elongation. Weldable. Columbium steel. Up to 3/8" thick. C 0.26%.

Ref: as for (35).

(39) KSC

45 ksi yp. Weldable.

(40) KSC

50 ksi yp. Weldable.

(41) KSC

60 ksi yp. Weldable.

(42) KSC

65 ksi yp. Weldable. Up to 3/4" thick.

(43) KSC

70 ksi yp. Weldable. Up to 1/2" thick.

(44) GLS GLX-W (from Weirton Steel).

40-60 ksi yp. 70 ksi uts. Weldable. C 0.16%. Mn 0.68%. Obtainable in shape only from WSC.

GROUP IV

HIGH RANGE (above 90 ksi) HEAT-TREATED ALLOY STEELS

(45) USS T-1

100-90 ksi yp. 115-105 ksi uts. 18-16% elongation. Weldable with care. C 0.10-0.21%. Mn 0.60-1.00%. Ref: ADUCO-01042 and 01101.

(46) USS T-1A

100 ksi yp. 115 ksi uts. 18-16% elongation. Weldable with care. C 0.12-0.21%. Mn 0.70-1.00%. Up to 1" thick. Cheaper than T-1 but with same structural properties. Ref: ADUCO-01114 and 01101.

3. NOTES

(1) Other steels than those listed above are available but are not listed for obvious reasons, for instance:

a. Low temperature steels such as ASTM 201 and the 9% nickel steels.

b. Corrosion resistant steels such as the copper steels.

c. Military steels such as HY-80. These steels are usually too expensive for structural use.

d. Stainless steels which are not generally available in structural shapes (see for instance USS ADUCO-3092).

e. Customer tailored steels such as an ASTM A440 steel in which corrosion resistance is not required allowing the copper percentage to be reduced.

(2) Proposed ASTM changes would eliminate A7 and A373 steel and replace these two steels and A36 by a single new A36 steel.

(3) Additional general references are:

i) Spectrum of Steels, Scalzi, J. Progressive Architecture, September 1961.

ii) BSC Folder 773.

iii) Design Manual for High Strength Steels, Priest, M. and Gilligan, J. USS ADUCO-02215.

iv) The Fourth Dimension in Design, Gilligan, J. USS ADUCU-04004.

v) Lighter Weight and Lower Cost Achieved with Stronger Steels, Haaijer, G. USS ADUCO-04004.

vi) ENR Report, High Strength Steel, Engineering News Record, February 15, 1962.

4. APPENDIX OF ASTM STANDARDS

TOPIC	A-7	A-373	A-36	A-440	A-441	A-242
Title	Steel for bridges & buildings	Structural steel for welding	Structural Steel	High strength structural steel	High strength low alloy structural manganese	High strength low alloy structural steel
Date of issue	1936	1954	1960	1959	1960	1941
Last date of revsn.	1961	1958	1961	1959	1960	1960
Coverage. (All specifications cover shapes plates and bars.)	Bearing pls & anchor bolts		Anchor bolts			
Comments	Nil	Nil	Riveted, bolted & welded	High strength riveted and bolted. High corrosion resistance.	High strength welded structural. High corrosion resistance.	High strength riveted, bolted and welded structural. High corrosion resistance.
Thickness restrictions	Not specd.	4"	4"	4"	4"	4"
Other materials	Nine matls specd.	Not specd.	Nine matls. as for A7	Not specd.	Not specd.	Not specd.

TOPIC	A-7	A-373	A-36	A-440	A-441	A-242
Delivery	As per ASTM A6	.....	.....	.....	.....	.....
Welding	Not specd.	Applicable	Applicable	Not suggested. Defects by ASTM A233	Applicable	Applicable but characteristics vary.
Carbon (max)	0.28% for shapes	0.28%	0.28%	0.28%	0.22%	0.22%
Manganese (max)	Not specd.	Specd. only for 13 shapes.	Not specd.	1.60%	1.25%	1.25%
Phosphorus (max)	0.04-0.11%	0.04%	0.04%	0.04-0.06%	0.04%	Not specd.
Sulphur (max)	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Copper (max)	0.20% for copper steel	0.20% for copper steel	0.20% for copper steel	0.20%	0.20%	0.20%
Silicon (max)	Not specd.	.....	.....	0.30%	0.30%	Not specd.
Vanadium	Not specd.	.....	.....	.....	0.02%	Not specd.

TOPIC	A-7	A-373	A-36	A-440	A-441	A-242
Yield Point (ksi)						
0 to 3/4"	33	32	36	50	50	50
3/4 to 1-1/2"	33	32	36	46	46	46
1-1/2 to 4"	33	32	36	42	42	42
Ultimate Stress (ksi)						
0 to 3/4"	60-75	58-75	60-80	70	70	70
3/4 to 1-1/2"	60-75	58-75	60-75	67	67	67
1-1/2 to 4"	60-75	58-75	60-75	63	63	63
Elongation 8" (%)						
0 to 3/4"	21	21	20	18	18	18
3/4 to 1-1/2"	21	21	20	19	19	19
1-1/2 to 4"	21	21	20	19	19	19
Elongation 2" (%)						
Any thickness	24	24	23	-	-	-
1-1/2 to 4"	-	-	-	24	24	24

5. ACKNOWLEDGEMENTS

This study is part of a general investigation "Welded Continuous Frames and Their Components" currently being carried out at Fritz Engineering Laboratory of the Civil Engineering Department of Lehigh University under the general direction of Lynn S. Beedle. The investigation is sponsored jointly by the Welding Research Council, and the Department of the Navy, with funds furnished by the American Institute of Steel Construction, the American Iron and Steel Institute, Lehigh University Institute of Research, the Bureau of Ships, and the Bureau of Yards and Docks. The Column Research Council acts in an advisory capacity.

The author wishes to thank the various steel companies for their prompt cooperation and Miss V. Austin for her patience in typing this report.