

±¼îÄÖÉÁð±ØÑ\$¹±ï×

pdfîÄµµ;ÉÄÜÔÚWAP¶Èä¯ÀÀìáÑé²»¼Ñ;£½¯òéÄúÓÁÏÈÑ;ÔñTXT£→»òîÄÔØÔ´îÄ¼µ½±
¾»ú²éç´;£

Speci?cation for Drill Pipe

API SPECIFICATION 5D FIFTH EDITION, OCTOBER 2001 EFFECTIVE DATE:
APRIL 30, 2002

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

Not for Resale

--``-``-``,,``,,``,,```

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

Not for Resale

--``-``-``,,``,,``,,```

Speci?cation for Drill Pipe

Upstream Segment API SPECIFICATION 5D FIFTH EDITION, OCTOBER 2001
EFFECTIVE DATE: APRIL 30, 2002

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

Not for Resale

--``-``-``,,``,,``,,```

SPECIAL NOTES

API publications necessarily address problems of a general nature.
With respect to particular circumstances, local, state, and federal
laws and regulations should be reviewed. API is not undertaking to meet
the duties of employers, manufacturers, or suppliers to warn and
properly train and equip their employees, and others exposed,
concerning health and safety risks and precautions, nor undertaking
their obligations under local, state, or federal laws. Information
concerning safety and health risks and proper precautions with respect
to particular materials and conditions should be obtained from the
employer, the manufacturer or supplier of that material, or the material
safety data sheet. Nothing contained in any API publication is to be
construed as granting any right, by implication or otherwise, for the
manufacture, sale, or use of any method, apparatus, or product covered
by letters patent. Neither should anything contained in the publication
be construed as insuring anyone against liability for infringement of
letters patent. Generally, API standards are reviewed and revised,
reaffirmed, or withdrawn at least every five years. Sometimes a one-time
extension of up to two years will be added to this review cycle. This

--`-`-`,,`,,`,,`,,`

The purchaser should also state on the purchase order the requirements concerning the following stipulations, which are optional with the purchaser: Heat treatment of drill pipe;-;- 4.2 Heat and supplementary analyses;-;- 5.2, 5.3 Pipe coatings ;;- 11.6 Markings in metric units;-;- 11.2.3, 11.2.4, 11.2.6 Drill pipe with special threads or end finish;-;- 9.1 Pipe ends ;;- Section 9 Marking requirements;-;- 11.1 Under-thickness tolerance if less than 12.5 percent (Group 3 product only) ;;- 8.3 Supplementary Requirements SR2?Nondestructive Inspection (N5 Notch or 1/16-in. Hole) ;;- Appendix B SR15?Test Certificates for Oil Country Tubular Goods ;;- Appendix B SR19?Charpy V-Notch Impact Toughness Testing of Group 1 (Grade E-75) Drill Pipe;-;- Appendix B SR20?Alternate Low Temperature Charpy V-Notch Impact Toughness Testing of Group 1 (Grade E-75) and Group 3 (Grades X-95, G-105, and S-135) Drill Pipe;-;- Appendix B Monogram Marking* ;;- D.2?Appendix D *Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing use of the monogram is contained in Appendix D, herein. No other use of the monogram is permitted. Licensees may mark products in conformance with Appendix D or Section 11 and Nonlicensees may mark products in conformance with Section 11. SPECIAL NOTE: NOTHING IN THIS SPECIFICATION SHOULD BE INTERPRETED AS INDICATING A PREFERENCE BY THE COMMITTEE FOR ANY MATERIAL OR PROCESS OR AS INDICATING EQUALITY BETWEEN THE VARIOUS MATERIALS OR PROCESSES. IN THE SELECTION OF MATERIALS AND PROCESSES, THE PURCHASER MUST BE GUIDED BY HIS EXPERIENCE AND BY THE SERVICE FOR WHICH THE PIPE IS INTENDED.

Not for Resale

CONTENTS

Page

1

SCOPE 1.1

Coverage 1.2 Retention of

Records 1.3 Testing

Equipment 1.4 Special

Processes

.	1.5
Certification	
.	
REFERENCES	
.	2.1
General	
.	2.2
Requirements	
.	2.3 Equivalent
Standards	
.	2.4 Referenced
Standards	
.	PROCESS OF
MANUFACTURE	
.	4.1
General	
.	4.2 Heat
Treatment.	
.	4.3 Pipe
Material	
.	4.4 Lot Definition?Groups
1 and 3	
4.5	
Traceability.	
.	CHEMICAL
COMPOSITION	
.	5.1 Chemical
Requirements.	
.	5.2 Heat
Analyses.	
.	5.3 Product
Analyses	
.	5.4 Recheck Product Analyses?All
Groups	
MECHANICAL	PROPERTIES
REQUIREMENTS.	6.1
Tensile	
Properties.	
.	6.2 Yield
Strength	
.	6.3 Longitudinal Impact
Requirements	
6.4 Energy Requirements, Longitudinal Charpy Impact	
Tests	6.5 Alternate Low Temperature

Not for Resale

Page

9

PIPE

ENDS 15 9.1
 15 15 15 15
 General 15 16 16 16 16 16 17 17 17 18 18 18 19 19 19 19

10

PIPE

INSPECTION. 10.1
 10.2 Inspection
 General 10.3 Pipe Inspection
 Requirements
 Coverage
 10.4 Pipe Body Wall Thickness
 Verification
 10.5 Visual
 Inspection
 10.6 Standard Procedure for
 Inspection
 10.7 Reference
 Standards
 10.8 Automated Inspection System
 Signal Evaluation 10.9
 Records Verifying System
 Capability
 10.10 Certification and Qualification of
 Personnel 10.11
 Evaluation of Indications
 (Prove-up)
 10.12
 Disposition
 11 MARKING AND
 COATINGS.
 11.1
 General
 11.2 Pipe
 Markings
 11.3 Die-Stamped
 Markings
 11.4 Paint-Stenciled

Markings									
.									
Markings						11.5	Pipe Processor		
.									
Coatings									11.6
.									
12 MINIMUM FACILITY REQUIREMENTS FOR VARIOUS CATEGORIES OF MANUFACTURERS									
19						12.1			Pipe
Mill.									
.									
Processor								19	12.2
.									
.								19	APPENDIX A
APPENDIX B APPENDIX C APPENDIX D APPENDIX M METRIC TABLES									
SUPPLEMENTARY REQUIREMENTS									
PURCHASER INSPECTION									
USE OF API MONOGRAM									
METRIC CONVERSION PROCEDURE.									
21 25 29 31 33									
Figures									
Specimens		1				Tensile			Test
.									
.						8	2	Impact Test Specimen	
Orientation? Longitudinal Specimens									9
3 Upset Drill Pipe for Weld-on Tool Joints (Group 1).						12	4	Upset Drill Pipe	
for Weld-on Tool Joints (Group 3).									
12 5 Saddle Gage for Measuring Eccentricity of Drill Pipe.								14	SR-2 Reference
Standard									
.									
.						25	Tables 1 2 3 4 5 6 7 8 9		
10 API Drill Pipe									
List.									
.									
.								1	Retention of
Records.									
.									
.								2	Chemical
Requirements									
.									
.								4	Tensile
Requirements									
.									
.								5	Elongation
Table									
.									
.								5	Impact Energy
Requirements									
.									
.								7	Upset Drill Pipe for Weld-on Tool Joints

Dimensions and Weights (Group 1) 11 Upset Drill Pipe for Weld-on
Tool Joints Dimensions and Weights (Group 3) 13 Tolerances
on Dimensions and
Weights 14
14 Drill Pipe Upset Maximum Permissible Depth of
Imperfections 15

vi

--`-`-`,,`,,`,,`,,`

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

Not for Resale

Page

11 Pipe Body Inspection
Methods
12 Artificial Reference
Indicators
A-1 Upset Drill Pipe for Weld-on Tool Joints?Dimensions and Weights
(Group 1),
Metric.
. A-2 Upset
Drill Pipe for Weld-on Tool Joints?Dimensions and Weights (Group 3),
Metric.
. A-3 Tolerances
on Dimensions and Weights, Metric
SR20 Impact Energy
Requirements

16 17 21 22 23 27

--`-`-`,,`,,`,,`,,`

vii

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

Not for Resale

Copyright American Petroleum Institute Provided by IHS under
license with API No reproduction or networking permitted without
license from IHS

--`-`-`,,`,,`,,`,,`

Not for Resale

Specification for Drill Pipe

1 Scope

1.1 COVERAGE 1.1.1 This specification covers Group 1 and Group 3 drill
pipe as described below in the designations and wall thicknesses as

Mechanical Properties Tensile Tests Control Tests 6.1 7.1.5

Mechanical Testing of Steel Products, Annex II, Steel Tubular Products Method, Practices and Definitions for Chemical Analysis of Steel Products Practices for Load Verification of Testing Machines Methods for Notched Bar Impact Testing of Metallic Materials Methods of Verification and Classification of Extensometers Standard Practice for Liquid Penetrant Inspection Method Standard Practice for Ultrasonic Examination of Metal Pipe and Tubing Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation Standard Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products Standard Practice for Magnetic Particle Examination

ASNT2 Recommended Practice SNT-TC-1A (1984 edition)

1American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959. 2American Society for Nondestructive Testing, 1711 Arlington Lane, P.O. Box 28518, Columbus, Ohio 43228-0318.

Calibration

Various Sections

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

SPECIFICATION FOR DRILL PIPE

3

3 Definitions

For the purposes of this specification, the following definitions apply: 3.1 carload: The quantity of pipe loaded on a rail car for shipment from the pipe-making facilities. 3.2 defect: An imperfection of sufficient magnitude to warrant rejection of the product based on the stipulations of this specification. 3.3 elephant hide: The wrinkled outside diameter surfaces of the pipe caused by the upsetting of end areas exposed to forging temperatures. 3.4 heat: The metal produced by a single cycle of a batch melting process. 3.5 heat analysis: The chemical analysis representative of a heat as reported by the metal producer. 3.6 imperfection: A discontinuity or irregularity in the product detected by methods outlined in this specification. 3.7 inspection: The process of measuring, examining, testing, gauging, or otherwise comparing the unit of product with the applicable requirements. 3.8 inspection lot: A definite quantity of product manufactured under conditions that are considered uniform for the attribute to be inspected. 3.9 inspection lot sample: One or more units of product selected from an inspection lot to represent that inspection lot. 3.10 inspection lot size: The number of units in an inspection lot. 3.11 linear imperfections: Include, but are not limited to, cracks,

seams, laps, plug scores, cuts, gouges, and elephant hide. 3.12 manufacturer: The term manufacturer as used throughout this specification refers to the firm, company, or corporation responsible for marking the product to warrant that the product conforms to the specification. The manufacturer may be either a pipe mill or processor. The manufacturer is responsible for compliance with all of the applicable provisions of the specification. 3.13 may: Used to indicate that a provision is optional. 3.14 nonlinear imperfections: Include, but are not limited to, pits and round bottom die-stamping. 3.15 outside diameter exposed surfaces: 1) For EUE and IEUE, the areas are the upset (Leu), taper (meu), and adjacent pipe body. 2) For IUE, the area over the upset (Liu), the area over the internal taper (miu), and the adjacent pipe body. 3.16 pipe mill: A firm, company, or corporation that operates pipe-making facilities.

3.17 processor: A firm, company, or corporation that operates facilities capable of heat treating pipe made by a pipe mill. 3.18 shall: Used to indicate that a provision is mandatory. 3.19 should: Used to indicate that a provision is not mandatory, but recommended as good practice.

4 Process of Manufacture

4.1 GENERAL Drill pipe furnished to this specification shall be made by the seamless process defined as follows: a. Seamless pipe is a wrought steel tubular product made without a welded seam. It is manufactured by hot-working steel, or if necessary, by subsequently cold-finishing the hotworked tubular product to produce the desired shape, dimensions, and properties. b. Cold drawn drill pipe, without appropriate heat treatment, is not acceptable. 4.2 HEAT TREATMENT The heat treating process shall be performed in accordance with a documented procedure. a. Group 1 Drill pipe shall be normalized or at the manufacturer's option normalized and tempered, or quenched and tempered full length; and if upset, shall be so heat treated after upsetting. b. Group 3 Unless otherwise agreed upon between purchaser and manufacturer, drill pipe furnished to this specification shall be quenched and tempered, or normalized and tempered. Upset drill pipe shall be heat treated full length after upsetting. 4.3 PIPE MATERIAL The various grades and groups of steel furnished to this specification shall be made to the grain practice. Steel made to the grain practice contains one or more grain refining elements, such as aluminum, columbium, vanadium, or titanium in amounts intended to result in the steel having a fine austenitic grain size. 4.4 LOT DEFINITION;^a GROUPS 1 AND 3 A lot is defined as all those lengths of pipe with the same specified dimension and grade which are heat treated as part of the continuous operation (or batch) and are from a single heat of steel; or, from different heats that are grouped according to a documented procedure that will ensure the appropriate

requirements of this specification are met.

--`-`-`,,`,,`,,`

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

4

API SPECIFICATION 5D

4.5 TRACEABILITY The manufacturer shall establish and follow procedures for maintaining heat and/or lot identity until all required heat and/or lot tests are performed and conformance with specification requirements has been shown.

5 Chemical Composition

5.1 CHEMICAL REQUIREMENTS Drill pipe furnished to this specification shall conform to the chemical requirements specified in Table 3. Table 3;^aChemical Requirements

Phosphorus Max. Percent 0.030 Sulfur Max. Percent 0.030

option the entire heat shall be rejected, or each of the remaining lengths shall be tested individually. In the individual testing of the remaining lengths in any heat, analyses for only the rejecting element or elements need be determined. Samples for recheck product analyses shall be taken in the same manner as specified for product analysis samples. The results of all recheck product analyses shall be provided to the purchaser when specified on the purchase order.

6 Mechanical Properties Requirements

6.1 TENSILE PROPERTIES 6.1.1 Pipe furnished to this specification shall conform to the tensile requirements specified in Table 4 for the particular grade ordered. When elongation is recorded or reported, the record or report shall show the nominal width of the test specimen when strip specimens are used; the diameter and gauge length when round bar specimens are used; or state when full section specimens are used. The tensile properties, except elongation, of the upset ends shall comply with the requirements given for the pipe body. In case of dispute, the properties (except elongation) of the upset shall be determined from a tensile test specimen cut from the upset. 6.1.2 See the equation in Table 4 for determination of the minimum elongation and Table 5 for minimum elongation values for various size tensile specimens and grades. 6.2 YIELD STRENGTH The yield strength shall be the tensile stress required to produce a total elongation of the gauge length, as determined by an extensometer, as follows:

Total Extension of Gauge Length, Percent 0.5 0.5 0.6 0.7

Steel All Groups

5.2 HEAT ANALYSES When requested by the purchaser, the manufacturer shall furnish a report giving the heat analysis of each heat of steel

The minimum elongation in 2 in. (50.80 mm) shall be that determined by the following formula:

$A e = 625,000 0.9 U$ where e = minimum elongation in 2 in. (50.80 mm) in percent rounded to nearest 0.5%, A = cross-sectional area of the tensile test specimen in square inches, based on specified outside diameter, or nominal specimen width, and specified wall thickness, rounded to the nearest 0.01 in.², or 0.75 in.², whichever is smaller, U = specified tensile strength, psi. Note: See Table 5 for minimum elongation values for various size strip tensile specimens and grades. The minimum elongation for either round bar tensile specimen (0.350-in. diameter with 1.4-in. gauge length and the 0.500-in. diameter with 2.00-in. gauge length) shall be that shown in Table 5 for a cross-sectional area A of 0.20 in.².

--`-`-`,,`,,`,,`,,`

Table 5; ^aElongation Table

1 Tabulated below are the minimum elongation values calculated by the formula given in Table 4. 2 3 4 5 6 7 8 Elongation in 2 in., Minimum, Percent Tensile Test Specimen Grade Specified Wall Thickness, in. E-75 X-95 G-105 S-135

3/ in. Strip 4

Area A in. ² 0.75 and Greater	0.74	0.73	0.72	0.71	0.70	0.69	0.68	0.67	0.66	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.55
Specimen	.994																			and
Greater	.980D.993	.967D.979	.954D.966	.941D.953	.927D.940	.914D.926	.900D.913	.887D.899	.874D.886	.861D.873	.847D.860	.834D.846	.820D.833	.807D.819	.794D.806	.781D.793	.767D.780	.754D.766	.740D.753	.727D.739

1 in. Strip Specimen .746 and

Greater	.735D.745	.726D.734	.715D.725	.706D.714	.695D.705	.686D.694	.675D.685	.666D.674	.655D.665	.646D.654	.635D.645	.626D.634	.615D.625	.606D.614	.595D.605	.586D.594	.575D.585	.566D.574	.555D.565	.546D.554
---------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

1 1/2 in. Strip Specimen .497 and

Greater	.490D.496	.484D.489	.477D.483	.471D.476	.464D.470	.457D.463	.450D.456	.444D.449	.437D.443	.431D.436	.424D.430	.417D.423	.410D.416	.404D.409	.397D.403	.391D.396	.384D.390	.377D.383	.370D.376	.364D.369
---------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

100,000 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.0 18.0 18.0 18.0 18.0 18.0 18.0 18.0 17.5 17.5 17.5 17.5

Specified Tensile Strength, psi 105,000 115,000 18.0 16.5 18.0 16.5 18.0 16.5 17.5 16.5 17.5 16.5 17.5 16.0 17.5 17.5 17.5 17.5 17.5 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 16.0 16.0 16.0 16.0 16.0 16.0 16.0 16.0 15.5 15.5 15.5 15.5 15.5 15.5

145,000 13.5 13.5 13.5 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0

13.0 13.0 13.0 13.0 12.5 12.5 12.5 12.5 12.5

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

6

API SPECIFICATION 5D

Table 5; ^aElongation Table (Continued)

1 Tabulated below are the minimum elongation values calculated by the formula given in Table 4. 2 3 4 5 6 7 8 Elongation in 2 in., Minimum, Percent Tensile Test Specimen Grade Specified Wall Thickness, in. E-75 X-95 G-105 S-135

3/ in. Strip 4

Area A in. 2 0.54 0.53 0.52 0.51 0.50 0.49 0.48 0.47 0.46 0.45 0.44 0.43 0.42 0.41 0.40 0.39 0.38 0.37 0.36 0.35 0.34 0.33 0.32 0.31 0.30 0.29 0.28 0.27 0.26 0.25 0.24 0.23 0.22 0.21 0.20 0.19 0.18 0.17 0.16 0.15 0.14

Specimen .714D.726 .701D.713 .687D.700 .674D.686 .660D.673 .647D.659 .634D.646 .621D.633 .607D.620 .594D.606 .580D.593 .567D.579 .554D.566 .541D.553 .527D.540 .514D.526 .500D.513 .487D.499 .474D.486 .461D.473 .447D.460 .434D.446 .420D.433 .407D.419 .394D.406 .381D.393 .367D.380 .354D.366 .340D.353 .327D.339 .314D.326 .301D.313 .287D.300 .274D.286 .260D.273 .247D.259 .234D.246 .221D.233 .207D.220 .194D.206 .180D.193

1 in. Strip

Specimen .535D.545 .526D.534 .515D.525 .506D.514 .495D.505 .486D.494 .475D.485 .466D.474 .455D.465 .446D.454 .435D.445 .426D.434 .415D.425 .406D.414 .395D.405 .386D.394 .375D.385 .366D.374 .355D.365 .346D.354 .335D.345 .326D.334 .315D.325 .306D.314 .295D.305 .286D.294 .275D.285 .266D.274 .255D.265 .246-.254 .235D.245 .223D.234 .215D.225 .206D.214 .195D.205 .186D.194 .175D.185 .166D.174 .155D.165 .146D.154 .135D.145

1 1/2 in. Strip

Specimen .357D.363 .351D.356 .344D.350 .337D.343 .330D.336 .324D.329 .317D.323 .311D.316 .304D.310 .297D.303 .290D.296 .284D.289 .277D.283 .271D.276 .264D.270 .257D.263 .250D.256 .244D.249 .237D.243 .231D.236 .224D.230 .217D.223 .210D.216 .204D.209 .197D.203 .191D.196 .184D.190 .177D.183 .170D.176 .164D.169 .157D.163 .151D.156 .144D.150 .137D.143 .130D.136 .124D.129 .117D.123 .111D.116 .104D.110 .097D.103 .091D.096

100,000 17.5 17.5 17.5 17.5 17.0 17.0 17.0 17.0 17.0 17.0 17.0 16.5 16.5 16.5 16.5 16.5 16.0 16.0 16.0 16.0 16.0 15.5 15.5 15.5 15.5 15.5 15.0 15.0 15.0 15.0 15.0 14.5 14.5 14.5 14.5 14.0 14.0 14.0 13.5 13.5

13.5

Specified Tensile Strength, psi		105,000	115,000	16.5	15.5	16.5	15.5
16.5	15.5	16.5	15.0	16.5	15.0	16.5	16.5
16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0
16.0	15.5	15.5	15.5	15.5	15.5	15.5	15.0
15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
14.5	14.5	14.5	14.0	14.0	14.0	14.0	13.5
13.5	13.5	13.5	13.5	13.5	13.5	13.0	13.0
13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
15.0	15.0	15.0	15.0	15.0	14.5	14.5	14.5
14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
14.0	14.0	14.0	14.0	14.0	13.5	13.5	13.5
13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0
13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
13.0	12.5	12.5	12.5	12.0	12.0	12.0	12.0

145,000	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.0	12.0	12.0	12.0	12.0	12.0
12.0	12.0	12.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.0	11.0
11.0	11.0	11.0	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.0	10.0	10.0	10.0
9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

--`-`-`,,`,,`,,`,,`

Not for Resale

SPECIFICATION FOR DRILL PIPE

7

6.4 ENERGY REQUIREMENTS, LONGITUDINAL CHARPY IMPACT TESTS Standard specimens 10 x 10 mm in cross section shall be used unless the wall thickness of the pipe to be tested is of insufficient thickness, in which case the largest obtainable subsize specimen shall be used. The minimum impact energy requirements for longitudinal specimens tested at 70°F ± 5°F (21°C ± 2.8°C) shall be as listed in Table 6. 6.5 ALTERNATE LOW TEMPERATURE ENERGY REQUIREMENTS By agreement between the purchaser and the manufacturer, pipe furnished to this specification shall conform to the requirements specified in SR20.

Table 6; Impact Energy Requirements

1	2	Minimum Average Charpy V-notch Impact Energy of Each Set of Three Specimens	ft/lb (J)	40 (54)	32 (43)	22 (30)	3	Minimum Charpy V-notch Impact Energy of Any Specimen of a Set	ft/lb (J)	35 (47)	28 (38)	19 (26)
---	---	---	-----------	---------	---------	---------	---	---	-----------	---------	---------	---------

Specimen Size mm x mm 10 x 10.0 10 x 7.5 10 x 5.0

7 Testing

7.1 TENSILE TESTS 7.1.1 Procedures Tensile properties of the pipe body shall be determined by tests on longitudinal specimens conforming to the requirements of 7.1.3, and the latest edition of ASTM A370. Tensile tests shall be made with the specimens at room temperature. The strain rate during tensile testing shall be in accordance with the requirements of the latest edition of ASTM A370. 7.1.2 Equipment Tensile test machines shall have been calibrated within 15 months preceding any test in accordance with the procedures of ASTM E4. Extensometers shall be calibrated within 15 months preceding any test in accordance

with the procedures of ASTM E83. Records retention shall be per 1.3.

7.1.3 Specimens Tensile test specimens from the pipe body shall be either full-section specimens, strip specimens, or round bar specimens as shown in Figure 1, at the option of the manufacturer. The type and size of the specimen shall be reported. Round bar specimens shall be taken from the mid-wall. Strip specimens and round bar specimens may be taken from any location about the pipe circumference at the option of the manufacturer. Tensile test specimens shall be removed from pipe subsequent to Tnal heat treatment on the production line. All strip specimens shall be approximately 1 1/2 in. (38.1 mm) wide in the gauge length if suitable curved face testing grips are used, or if the ends of the specimen are machined or cold ?attened to reduce the curvature in the grip area; otherwise they shall be approximately 3/4 in. (19.0 mm) wide for pipe 3 1/2 in. and smaller and approximately 1 in. (25.4 mm) wide for pipe 4 in. and larger. All specimens shall represent the full wall thickness of the pipe from which the specimen was cut, except for round

--`-`-`,,`,,`,,`

bar tensile specimens, and shall be tested without ?attening. The 0.500 in. (12.7 mm) diameter round bar specimen shall be used when the pipe size allows, and the 0.350 in. (8.75 mm) diameter round bar specimen shall be used for other sizes. For pipe sizes too small to allow a 0.350 in. (8.75 mm) specimen, round bar tensile specimens are not permitted.

7.1.4 Number of Tensile Tests

7.1.4.1 Group 1 (Grade E) One tensile test shall be made on a length of drill pipe from each lot of 400 lengths or less of each size 5 1/2 in. and smaller, and from each lot of 200 lengths or less of each size 6 5/8 in. and larger, provided that, in the case of heat treated pipe, all the lengths in each lot shall have received the same heat treatment. For multiple-length seamless pipe, a length shall be considered as all of the sections cut from a particular multiple length.

7.1.4.2 Group 3 (Grades X, G, and S) One tensile test shall be made on a length of drill pipe from each lot of 200 lengths or less of each size 5 1/2 and smaller; and from each lot of 100 lengths or less of each size 6 5/8 and larger; provided that, in the case of heat treated pipe, all the lengths in each lot shall have received the same heat treatment. For multiple-length seamless pipe, a length shall be considered as all of the sections cut from a particular multiple length.

7.1.5 Mill Control Tests One tensile test shall be made as a control on each heat of steel used by the manufacturer for the production of pipe under this specification. A record of such tests shall be available to the purchaser.

7.1.6 Retests If the tensile test specimen representing a lot of pipe fails to conform to the specified requirements, the manufacturer may elect to make retests on three additional lengths from the same

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

8

API SPECIFICATION 5D

lot. If all of the retest specimens conform to the requirements, all the lengths in the lot shall be accepted except the length from which the initial specimen was taken. If more than one of the original test specimens fails or one or more of the retest specimens fail to conform to the specified requirements, the manufacturer may elect to individually test the remaining lengths in the lot, in which case determinations are necessary only for the particular requirements with which the specimens failed to comply in the preceding tests. Specimens for retests shall be taken in the same manner as specified in 7.1.3. Material from the same heat of steel which has been rejected by one or more of the above criteria may be reheat treated and retested, as by definition it is then a new lot of pipe.

7.1.7 Defective Specimens If any tensile specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted. When the elongation of any tensile specimen is less than that specified, if any part of the fracture is outside the middle third of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed. 7.2 CHEMICAL ANALYSIS Chemical analyses shall be determined by any of the procedures commonly used for determining chemical compositions such as emission spectroscopy, X-ray emission, atomic absorption, combustion techniques or wet analytical procedures. The calibration methods used shall be traceable to established standards. All chemical analyses shall be made in accordance with ASTM A751. 7.3 LONGITUDINAL IMPACT TESTS 7.3.1 Procedures

Full-section Specimen Reduced section 2 1/4" min. (57.2 mm) Approx. 1 1/2" (38.1 mm) *

Gauge length 1" R min. 2.000" ± .010" (25.4 mm) (50.80 ± 0.25 mm) Strip Specimen* *See 7.1.3 for testing without use of suitable curved face testing grips.

t

Charpy V-notch Type A impact tests shall be conducted at 70°F ± 5°F (21°C ± 2.8°C). Tests shall be conducted as specified in the latest edition of ASTM A370 and ASTM E23. For alternate test temperature, see SR20. A test shall consist of three specimens. The energy requirements are specified in 6.3. 7.3.2 Impact Specimens

G D R A

Copyright American Petroleum Institute Provided by IHS under

license with API No reproduction or networking permitted without license from IHS

--`-`-`,,`,,`,,`

Three specimens shall be taken parallel to the axis of the pipe with the notch oriented radially as shown in Figure 2. Impact test specimens shall not be machined from pipe which has been ?attened. 7.3.3 Defective Specimens

A D
G
R

Round Bar Specimen 0.500 in. Diameter in. Gauge length Diameter Radius of Tilet, min. Length of reduced section, min. 2.000 ;À 0.005 0.500 ;À 0.010

3/ 8

0.350 in. Diameter in. 1.400 ;À 0.005 0.350 ;À 0.007

1/ 4

Specimens showing material imperfections or defective preparation, whether observed before or after breaking, may be discarded, and replacements shall be considered as original specimens. Specimens shall not be judged defective simply because they failed to exhibit the minimum absorbed energy requirement. 7.3.4 Frequency of Testing; Group 3 (Grades X, G, and S) Three Charpy V-notch specimens representing one test shall be taken from one length of drill pipe from each lot of 200 lengths or less of sizes 5 1/2 and smaller, and from each lot of 100 lengths or less of size 6 5/8, provided that, in the case of heat-treated pipe, all lengths have received the same heat treatment. For multiple-length seamless pipe, a length shall be considered as all of the sections cut from a particular multiple length.

mm 50.0 ;À 0.10 12.5 ;À 0.25 10 60

mm 35.0 ;À 0.10 8.75 ;À 0.18 6 45

2 1/4

1 3/4

Round Bar Specimen

Figure 1; Tensile Test Specimens

Not for Resale

SPECIFICATION FOR DRILL PIPE

9

7.3.5 Impact Retest; All Groups 7.3.5.1 If the impact test of a set of specimens does not meet the requirements of 6.3, the manufacturer may retest a set of three additional specimens from the same length of pipe. All three of these specimens shall have energy values equal to or exceeding the minimum average values in Table 6. 7.3.5.2 If the retested specimens fail to conform to the requirement in 7.3.5.1, an additional set of three specimens shall be taken from each of two

0.2% of the total length of the pipe measured from one end of the pipe to the other end. b. 0.125 in. of the 5 ft length at each end. Measurement of the deviation shall not be made in the plane of the upset or the upset fade-away. 8.7 DRIFT REQUIREMENTS Each length of Group 1 external upset drill pipe, except 3 1/2 in. 13.30 lb, shall be tested throughout the length of the end upset with a drift mandrel having a diameter, $d \leq D - 3/16$ in. ($d \leq D - 4.76$ mm) smaller than the tabulated d of the drill pipe, and a length of 4 in. (102 mm). 8.8 IMPERFECTIONS AND DEFECTS An imperfection is a discontinuity or irregularity in the product, detected by methods outlined in this specification. An imperfection is considered a defect when it is of sufficient magnitude to warrant rejection of the product based on the stipulations of this specification. All pipe shall be free from defects as defined below: 8.8.1 Surface Breaking Pipe Body Defects Any imperfection on the outside or inside surface, of any orientation, shall be considered a defect if: a. It is linear and deeper than 12.5% of the specified wall thickness in the radial direction for Grades E-75, X-95, G-105, or is linear and deeper than 5% of the specified wall thickness in the radial direction for Grades S-135; or, b. It is linear or nonlinear and results in a wall thickness above or below the imperfection with a value less than the minimum permissible wall thickness.

Note: Linear imperfections include, but are not limited to, cracks, seams, laps, plug scores, cuts, gouges, and elephant hide. Nonlinear imperfections include, but are not limited to, pits and round bottom die-stamping.

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

SPECIFICATION FOR DRILL PIPE

11

Table 7; ^aUpset Drill Pipe for Weld-on Tool Joints Dimensions and Weights (Group 1)

1	2	3	4	5	6	7	8	9	10	11	12	13	Calculated Weight	Upset Dimensions,
in.	e, f Length of Inside Length Length Length of Length End of of External	Taper of Pipe to Outside Diameter Internal Diameter ² at End Upset ^g	Internal External Taper +1/8, of Pipe, c +1 1/2 h Taper, g Upset, Fadeout,	D1/32 Min. Min. Min. Max. Max. ; $\Delta 1/16$ D1/2 Dou dou Liu 13/4 13/4 13/4	13/4 13/4 13/4 13/4 13/4 ? ? ? 2 1/4 ? ? ? ? ? ? ? miu 11/2 ? 11/2 11/2 ?	2 ? ? ? ? ? 2 ? ? ? ? ? ? ? 2 2 2 2 2 2 2 2 2 Leu ? ? ? ? ? ? ? ? ? 11/2 11/2	11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2	3 3 ? ? ? ? ? ? ? ? 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2 11/2	1 1 1 1 1 1 ? ? meu ? 11/2 11/2 11/2	11/2 11/2 11/2 ? ? Leu + meu ? ? ? ? ? ? ? ? ? ? 4 4 4 4 4 4 4 4 4 4 ? ? ? ? ? ?				

may be the same as for the higher grades in Group 3. g31/ " OD 13.3 lb/ft External-Upset Drill Pipe has a slight internal upset not illustrated in Figure 3. 2 hL tolerance for 65/ weights is + 2, D 1/ in. iu 8 2 *These sizes and weights are tentative. Notes: 1. See Figure 3. 2. See Appendix A for metric tables.

Not for Resale

12

API SPECIFICATION 5D

meu

Leu

meu

Leu

’ ’

miu Liu miu Liu Dou Dou Dou d D dou d D dou d D dou

Internal Upset External Upset Internal-External Upset Note: See Table 7 for drill pipe dimensions.

Figure 3; ^aUpset Drill Pipe for Weld-on Tool Joints (Group 1)

meu

Leu

meu

Leu

’ ’ ’ ’ ’ ’ ’ ’ ’ ’ ’

Liu Liu miu Liu Dou Dou Dou d D dou d D dou d D dou

Internal Upset External Upset Internal-External Upset Notes: a. See Table 8 for drill pipe dimensions. b. Permissible internal taper within length Liu shall not exceed 1/4 in./ft (21 mm/m) on diameter.

’ ’ ’ ’ ’ ’ ’ ’ ’ ’ ’ ’ ’

Figure 4; ^aUpset Drill Pipe for Weld-on Tool Joints (Group 3) 8.8.2 Surface Breaking Pipe Upset Defects Any imperfection on the outside or inside surface, of any orientation, that is deeper than shown in Table 10, shall be considered a defect. The internal upset configuration on all upset products shall exhibit no sharp corners or drastic changes of section that would cause a 90° hook-type tool to hang up. 8.8.3 Elephant hide Elephant hide is the wrinkled outside diameter surfaces of the pipe caused by the upsetting of end areas exposed to forging temperatures. The outside diameter exposed surfaces are 1) for EU and IEU, the areas are the upset (Leu), taper (meu), and adjacent pipe body; and 2) for IU, the area over the upset (Liu), the area over the internal taper (miu), and the adjacent pipe body. 8.8.4 Quench Cracks Quench cracks detected by methods outlined in this specification shall be considered defects.

Note: Quench cracks in steel result from stresses produced during the austenite-to-martensite transformation, which is accompanied by an increase in volume (Reference: American Society for Metals, Metals

Handbook, Volume 20).

--`-`-`,,`,,`,,`,,`

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

SPECIFICATION FOR DRILL PIPE

13

Table 8; ^aUpset Drill Pipe for Weld-on Tool Joints Dimensions and Weights (Group 3)

1 2 3 4 5 6 7 8 9 10 11 12

Calculated Weight

Upset Dimensions, in. 5, 6 Inside Length of Outside Diameter at Internal Length of Length of Length End of End Upset Internal External Pipe to Taper Diameter b of Pipe, c +1 1/2 f Taper, Upset, Fadeout, Ext. +1/8, Min. Min. Upset Max. D1/32 ; A 1/16 D1/2 Dou dou 15/16 115/16 25/8 39/16 Liu 31/2 31/2 31/2 31/2 miu ? ? ? ? Leu ? ? ? ? Leu + meu ? ? ? ?

Designations a Size 27/8 31/24 5 Weight

Wall Inside Outside Thickness Diameter Diameter in. in. D t d

Plain End lb/ft wpe

Upset d lb ew

10.40 13.30 14.00 16.25

2.875 3.500 4.000 5.000

0.362 0.368 0.330 0.296

2.151 2.764 3.340 4.408

Internal-Upset Drill Pipe 9.72 5.41 2.875 12.32 7.41 3.500 12.95 8.81 4.250 14.88 13.61 5.000 External-Upset Drill Pipe 6.27 4.60 2.656 9.72 6.21 3.250 12.32 10.21 4.000 14.64 8.21 4.000 12.95 14.42 4.625 15.00 17.22 5.188 18.71 16.02 5.188 17.95 21.62 5.750 24.05 21.22 5.875

23/8 27/8 31/2 31/2 4 4 1/2 4 1/2 5 5

6.65 10.40 13.30 15.50 14.00 16.60 20.00 19.50 25.60

2.375 2.875 3.500 3.500 4.000 4.500 4.500 5.000 5.000

0.280 0.362 0.368 0.449 0.330 0.337 0.430 0.362 0.500

1.815 2.151 2.764 2.602 3.340 3.826 3.640 4.276 4.000

19/16 115/16 21/2 21/2 31/16 39/16 37/16 315/16 313/16

41/4 41/4 41/4 41/4 41/4 41/4 41/4 41/4 41/4

? ? ? ? ? ? ?

3 3 3 3 3 3 3 3

5 1/2 5 1/2 5 1/2 5 1/2 5 1/2 5 1/2 5 1/2 5 1/2 5 1/2

3 1/2 4 1/2 4 1/2 5 5 5 1/2 5 1/2 6 5/8 6 5/8

15.50 16.60 20.00 19.50 25.60 21.90 24.70 25.20 27.70

3.500 4.500 4.500 5.000 5.000 5.500 5.500 6.625 6.625

0.449 0.337 0.430 0.362 0.500 0.361 0.415 0.330 0.362

2.602 3.826 3.640 4.276 4.000 4.778 4.670 5.965 5.901

with a saddle gage (see Figure 5) at a distance of 5 to 6 in. from the end of the upset, shall not exceed 0.093 in. (total indicator reading). Inside Diameter: The maximum eccentricity of the bore of the upset with respect to the outside surface of the drill pipe shall not be more than 1/16 in. (1/8 in. total indicator reading). Ovality: Maximum ovality, measured with a micrometer on outside diameter of upset shall not exceed 0.093 in.

Wall Thickness, t ; - ; - D 12.5 percent Weight: Single lengths ; - ; - + 6.5 percent ; - ; - D 3.5 percent Range Lengths? All lengths in feet

Range: Total range length, incl ; - ; - a Range length for 95% or more of carload ; - ; - Permissible variation, max ; - ; - Permissible length, min ; - ; - a Range length for 90% or more of carload ; - ; - Permissible variation, max ; - ; - Permissible length, min ; - ; -

1 18D22 2 20 ? ?

2 27D30 ? ? 2 27

3 38D45 ? ? 3 38

a Carload tolerances shall not apply to order items of less than 40,000 lbs of pipe. For any carload of 40,000 lbs or more of pipe is shipped to the

Tnal destination without transfer or removal from the car, the tolerance shall apply to each car. For any order item consisting of 40,000 lbs or more of pipe that is shipped from the manufacturer's facility by rail, but not to the Tnal destination, the carload tolerance shall apply to the overall quantity of pipe shipped on the order item, but not to individual carloads. b Weight tolerance applies to the calculated weight (or adjusted calculated weight) for the end Tnish speciTed on the purchase order. Where under-thickness tolerances smaller than 12.5 percent are speciTed on the purchase order, the plus tolerance on weight for single lengths shall be increased to 19 percent less the speciTed under-tolerance. (Example: If an under-thickness tolerance of 10 percent is speciTed on the purchase order, the plus tolerance on weight for single lengths is 19 percent minus 10 percent, or 9 percent.)

5" to 6" (127 to 152 mm)

12" (304.8 mm)

12" (304.8 mm)

Figure 5; ^aSaddle Gage for Measuring Eccentricity of Drill Pipe

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

--``-``-``,,``,,``,,``

SPECIFICATION FOR DRILL PIPE

Table 10;^aDrill Pipe Upset Maximum Permissible Depth of Imperfections (Measured from the Surface)

Surface 1. All surfaces from the planes as specified in 2 and 3 below throughout the upset interval. Depth 12.5% Measurement Notes Percent of specified pipe body wall thickness; for nonlinear imperfections; for all grades of pipe. Percent of specified pipe body wall thickness; for linear imperfections; for Grade E-75 pipe. Percent of specified pipe body wall thickness; for linear imperfections; for Grades X-95, G-105, and S-135 pipe.

12.5%

5%

2. On the external upset surface from the end of the pipe to a plane at a distance equal to the specified minimum dimension L_{eu} (Figures 3 and 4) from the end of the pipe, maximum permissible depth is as indicated by the requirement for maintaining dimension D_{ou} . 3. On the internal upset surface from the end of the pipe to a plane at a distance equal to the specified minimum dimension L_{iu} (Figures 3 and 4) from the end of the pipe, maximum permissible depth is as indicated by the requirement for maintaining dimension d_{ou} . 4. The minimum wall thickness in the upset taper interval, and the maximum combined effect of coincident internal and external imperfections in all areas, shall not result in less than the minimum permissible wall thickness. 5. Elephant hide in the outside diameter exposed surfaces shall be inspected in accordance with Item 1 tolerances above.

9 Pipe Ends

9.1 GENERAL Drill pipe shall be furnished with upset ends for attachment of rotary connections by welding, unless otherwise agreed on by the purchaser and manufacturer, in which case all stipulations herein, other than end finish and calculated weights, shall govern. The inside and outside edges of the ends of all pipe shall be free of burrs.

Note: Special marking as shown in Section 11 is required for drill pipe furnished with plain ends or end finished not specified herein, but having the body of the pipe manufactured in accordance with the requirements specified herein.

10.2

INSPECTION REQUIREMENTS

The manufacturer shall inspect the pipe body using the methods required by Table 11 in accordance with 10.6, or by other inspection methods that have demonstrated the capability of detecting defects as defined in 8.8. The location of the equipment shall be at the discretion of the manufacturer; however, nondestructive inspection (excluding the visual method and pipe body wall thickness verification, see 10.4) shall take place after all heat treating and rotary straightening operations.

10.3 PIPE INSPECTION COVERAGE 10.3.1 Pipe Body

--``-``-``,,``,,``,,``

10 Pipe Inspection

10.1 GENERAL 10.1.1 Introduction This section establishes requirements for the nondestructive inspection (including visual inspection) and disposition of pipe covered in this specification. 10.1.2 Purchaser Inspection When stated on the purchase order, the provisions of Appendix C shall apply.

All pipe requiring nondestructive inspection (excluding the visual method) shall be inspected full length (end to end) for outside and inside surface defects. 10.3.2 End Area When an automated ultrasonic or electromagnetic inspection system (combined equipment, operating procedures, and personnel) is applied to meet the requirements of 10.3.1, end areas that are not covered by the automated inspection system shall be inspected for defects by the magnetic particle method or other inspection method with demonstrated capability of detecting defects as defined in 8.8. Such end area inspection

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

16

API SPECIFICATION 5D

shall be performed after final heat treatment and any rotary straightening; however, it need only be performed once. The combination of inspection methods shall inspect 100% of the outside and inside surfaces. 10.3.3 Pipe Upsets Forged upsets (including the upset runout interval) on all grades shall be inspected for outside and inside transverse surface defects by any of the methods listed in 10.6 and shall take place after all heat treating and rotary straightening. 10.4 PIPE BODY WALL THICKNESS VERIFICATION All drill pipe requiring electromagnetic or ultrasonic inspection per Table 11, shall have the wall thickness verified in a helical or longitudinal path over the length of the pipe, excluding end areas not covered by automated systems. The location and procedure of this verification process shall be at the discretion of the manufacturer. 10.5 VISUAL INSPECTION 10.5.1 Visual Inspection of the Pipe Body (Excluding Pipe Ends) Each pipe shall be visually inspected for defects on the entire outside surface. 10.5.2 Visual Inspection of Pipe Ends 10.5.2.1 Pipe ends shall be visually inspected on the outside surface for a minimum distance of 18 in. 10.5.2.2 Pipe ends shall be visually inspected on the inside surface for a minimum distance equal to the length of upset, including run-out interval. 10.5.2.3 If another method is applied with demonstrated capability of detecting defects as defined in 8.8, visual inspection of the ends is not required. 10.5.2.4 If cropping is performed per

10.12.2, the inside surface shall again be inspected per 10.5.2. 10.6 STANDARD PROCEDURE FOR INSPECTION For other than wall thickness verification and visual inspection, the inspections shall be performed, as a minimum, in accordance with the applicable ASTM standards (or equivalent standards) listed below: a. Electromagnetic (Flux Leakage);-;- E570 b. Electromagnetic (Eddy-Current);-;- E309 c. Ultrasonic;-;- E213

Table 11;^aPipe Body Inspection Methods

1 2 3 4 5 MPI (Circular Field) A ?

Grade E-75 X-95, G-105, S-135

Visual R R

EMI A A

UT A A

R = Required per 10.5. ? (dash) = Not Applicable. A = One method or any combination of methods shall be used.

d. Magnetic Particle;-;- E709 e. Liquid Penetrant ;-;- E165 10.7 REFERENCE STANDARDS 10.7.1 Ultrasonic and electromagnetic inspection systems for other than wall thickness verification shall use reference standards containing notches or holes as shown in Table 12 to verify equipment response from artificial reference indicators. 10.7.2 The manufacturer may use any documented procedures to establish the reject threshold for ultrasonic or electromagnetic inspection, provided the artificial reference indicators described in Table 12 can be detected dynamically under normal operating conditions. Such detection capability shall be demonstrated dynamically. At the option of the manufacturer, this may be performed either on-line or off-line. 10.7.3 Table 12 lists the reference indicators for manufacturers to use in establishing thresholds for sorting pipe that may contain defects as defined in 8.8. The reference indicators, used during automated ultrasonic or electromagnetic inspection, are not to be construed as being the defect sizes defined in 8.8, or be used by those other than the manufacturer as the only basis for rejection. 10.8 AUTOMATED INSPECTION SYSTEM SIGNAL EVALUATION All indications that are equal to or greater than the reject threshold shall be considered defects, unless it can be demonstrated that the imperfection causing the indication is not a defect as described in 8.8. Pipe with defects shall be given a disposition in accordance with 10.12. 10.9 RECORDS VERIFYING SYSTEM CAPABILITY Inspection system records shall be maintained to verify the system capabilities in detecting reference indicators as stated in 10.7. These records shall include calibration and operating procedures, equipment description, personnel qualifications, and dynamic test data demonstrating the system capabilities for detecting the reference indicators.

Copyright American Petroleum Institute Provided by IHS under

license with API No reproduction or networking permitted without license from IHS

Not for Resale

--`-`-`,,`,,`,,`

SPECIFICATION FOR DRILL PIPE

17

Table 12;^aArtificial Reference Indicators

1	2	3	4	5	6	7
Grade	Notch Location	Notch Orientation		Notch Dimensions		
Length Max., in.	Width Max., in.	at Full	in. at Full	Depth	2.0	2.0
2.0	.040	.040	.040	8	9	Radially Drilled Hole

Pipe Body E-75 X-95 and G-105 S-135

OD R R R

ID R R R

Long. R R R

Trans. N R R

Depth^b 12.5 12.5 5.0

Diameter

1/ 8 1/ 8 1/ 16

R = Required when using notches. N = Not Required. ^aNotches shall be rectangular or U-shaped per ASTM E213, Figure 2, Common Notch Shapes. At the option of the manufacturer, notches may be oriented at such an angle as to optimize detection of anticipated defects. ^bDepth as a percent of specified wall thickness. The depth tolerance shall be $\pm 15\%$ of the calculated notch depth with a minimum notch depth of 0.012" ± 0.002 " (0.3 ± 0.5 mm). ^cDrilled hole diameter (through the pipe wall) shall be used on drill bit sizes in inches. When calibrating EMI equipment using drilled holes, the inspection system shall be capable of producing signals from both ID and OD notches that are equal to or greater than the reject threshold established using the drilled hole. This system capability shall be recorded per 10.9. Note: The reference indicators defined above are convenient for verification of nondestructive testing equipment response. The dimensions of the notches or holes should not be construed as the minimum size imperfections detectable by such equipment. The inspections performed in accordance with 10.2, with the equipment calibrated to the reference indicators in Table 12, should not be construed as assuring that the material requirements in 8.8 have been met.

10.10 CERTIFICATION AND QUALIFICATION OF PERSONNEL As a minimum, ASNT Recommended Practice SNT-TC1A or equivalent shall be the basis for certification for nondestructive testing (NDT) personnel. Inspections (excluding the visual method) shall be conducted by Level I, II or III certified inspectors. 10.11 EVALUATION OF INDICATIONS (PROVE-UP) The manufacturer has the option of evaluating an indication, which is equal to or greater than the reject threshold, in accordance

with this paragraph or disposing of the indication as a defect per 10.12. Evaluations of indications shall be performed by Level I certified inspectors under the supervision of Level II or III certified inspectors, or by Level II or III certified inspectors. Evaluation of indications shall be performed in accordance with written procedures. For the evaluation of an indicated imperfection, the depth shall be measured to determine if it is a defect in accordance with 8.8. This measurement shall be performed as follows: a. The imperfection's depth may be measured using a mechanical measuring device (e.g., pit gauge, calipers, etc.). Removal of material by grinding or other means to facilitate measurement shall not reduce the remaining wall below the

minimum permissible wall thickness. Abrupt changes in wall thickness caused by probe grinding shall be removed. b. The imperfection's depth may be measured by an ultrasonic technique(s) (time and/or amplitude based, or other capable techniques). Verification of the ultrasonic technique(s) shall be documented, and show capability to differentiate imperfection sizes larger than the appropriate defect size stated in 8.8.1 and 8.8.2. c. If the purchaser and manufacturer do not agree on the evaluation test results, either party may require destructive evaluation of the material; after which, accountability shall be as described in C.4. d. Imperfections that have been evaluated and found to be defects shall be given a disposition in accordance with 10.12. 10.12 DISPOSITION Imperfections that satisfy the material requirements and are less than the defect size stated in 8.8 are allowed to remain in the pipe. Repair welding is not permitted. Pipe containing defects shall be given one of the following dispositions: 10.12.1 Grinding or Machining Defects shall be completely removed by grinding or machining, provided the remaining wall thickness is within specified limits. Generous radii shall be used to preclude

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

--`-`-`,,`,,`,,`,,`

18

API SPECIFICATION 5D

abrupt changes in wall thickness. Where the depth of the grind exceeds 10% of the specified wall thickness, the remaining wall thickness shall be verified in accordance with 7.4.2. After removal of the defect, the affected area shall be reinspected by one or more of the nondestructive inspection methods specified in 10.6 to verify complete removal of the defect. The manufacturer's documented prove-up procedures shall address the possibility that there may be other coincident defects in the affected area. The removal of defects

(including elephant hide) from the pipe body by grinding or machining more than 60% of the circumference of the pipe shall not reduce the outside diameter below the specified minimum outside diameter. 10.12.2 Cut-off The section of pipe containing the defect shall be cut-off within the limits of requirements on length of the intended product. 10.12.3 Rejected The pipe shall be rejected.

11.2.2 "°Spec 5D;± "°Spec 5D"® shall be die stamped, unless otherwise agreed upon between the purchaser and the manufacturer?in which case it shall be paint stenciled. The "°Spec 5D"® identity shall be applied only as specified and only by manufacturers who meet all requirements of this specification.

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing use of the monogram is contained in Appendix D herein. No other use of the monogram is permitted. Licensees may mark products in conformance with Appendix D or Section 11 and nonlicensees may mark products in conformance with Section 11.

11.2.3

Compatible Standards

Products in compliance with multiple compatible standards may be stamped or stenciled with the name of each standard (at the option of the manufacturer). 11.2.4 Unfinished Pipe Drill pipe furnished with plain ends or end finishes other than the upsets detailed herein, but having the body of the pipe manufactured in accordance with the requirements specified herein, shall be die stamped with the symbol UF immediately following "°Spec 5D,"® and any applicable compatible standard. 11.2.5 Designation 11.2.5.1 The size and weight designations are dimensionless quantities based on the former U.S. Customary size and weight per foot. 11.2.5.2 The size designation (Column 1, Tables 7 and 8) shall be paint stenciled. 11.2.5.3 The weight designation, as given in Tables 7 and 8, shall be die stamped and paint stenciled. 11.2.6 Grade The grade marking shall be die stamped and paint stenciled as follows: Grade E-75 E X G S

11 Marking and Coatings

11.1 GENERAL Drill pipe manufactured in conformance with this specification shall be marked by the manufacturer as specified hereinafter. Marking shall be die stamped or paint stenciled, or both, as stipulated, unless otherwise agreed upon between the purchaser and the manufacturer. The location, size, and sequence of markings shall be as specified in 11.3 and 11.4, except that, at the option of the manufacturer, hot-rolled or hot-stamped markings on pipe and couplings

result of heat treating (i.e., prior grade identity, original pipe manufacturer's name or logo). 11.6 COATINGS Unless otherwise ordered, pipe shall be given an external coating for protection from rust while in transit. An attempt should be made to make these coatings smooth, hard to the touch, and with minimum sags.

Note: If bare pipe or specially coated pipe is desired, the purchase order should so state. For special coatings, the purchase order should state further whether the coating is to be applied to the full length or whatever a certain specified distance from the end is to be left uncoated. Unless otherwise specified, such bare ends are commonly given a coating with oil for protection in transit.

4.8 6.4

12 Minimum Facility Requirements for Various Categories of Manufacturers

12.1 PIPE MILL 12.1.1 A pipe mill shall operate one or more pipe-making facilities capable of producing products as described in the Process of Manufacture Section of this specification. 12.1.2 A pipe mill shall also have facilities for conducting all required tests and inspections. Alternatively, and at the option of the pipe mill, any of these tests or inspections may be provided by a third party and may be located offsite. In the event that a third party performs any of these services, the conduct of such inspections and tests shall be controlled and monitored by the pipe mill in accordance with a documented procedure. 12.1.3 The pipe mill shall possess suitable equipment for, and be responsible for, weighing and marking pipe. 12.2 PROCESSOR 12.2.1 A processor shall operate heat-treating facilities capable of heat treating full lengths of pipe. A processor shall also have facilities for conducting all required tests and inspections. Alternatively, and at the option of the processor, any of these tests or inspections may be provided by a third party and may be located offsite. In the event that a third party performs any of these services, the conduct of such inspections and tests shall be controlled and monitored by the processor in accordance with a documented procedure. 12.2.2 The processor shall possess suitable equipment for, and be responsible for, weighing and marking pipe.

Not for Resale

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

--`-`-`,,`,,`,,`

Not for Resale

APPENDIX A; METRIC TABLES

The following tables provide the metric equivalents of U.S. Customary values for dimensions and weights.

149.90 22.32 27.84 26.70 35.80 29.52 33.57 33.05 36.06 3.68 3.91 3.91
 3.54 4.81 4.09 11.75 10.90 120.65 121.44 131.78 131.78 146.05 146.05
 177.80 177.80 80.17 76.20 93.66 87.31 101.60 101.60 135.00 135.00 63.50
 57.15 57.15 57.15 57.15 57.15 114.30 114.30 50.80 50.80 50.80 50.80
 50.80 50.80 50.80 50.80 38.10 38.10 38.10 38.10 38.10 38.10 76.20 76.20
 25.40 25.40 25.40 25.40 25.40 25.40 ? ? 38.10 38.10 38.10 38.10 38.10
 38.10 ? ? ? ? ? ? ? ? 139.70 139.70

aDesignations (Column 1) are shown for the purpose of identification in ordering. bFor internal-upset drill pipe, the tolerance on the outside diameter of the upset, D , shall be $+ 3.18 D$ 0 mm. A slight external upset within ou cMaximum taper on inside diameter of internal upset and internal-external upset is 20.8 mm/m (2.08%) on diameter. dWeight gain or loss due to end Tnishing. See 8.4. eThe speciTted upset dimensions do not necessarily agree with the bore and OD dimensions of Tnished weld-on assemblies. Upset dimensions were chosen to fBy agreement between purchaser and manufacturer or processor, the length of upset for Grade E drill pipe may be the same as for the higher grades in Group 3. g31/ " OD x 13.3 lb/ft External-Upset Drill Pipe has a slight internal upset not illustrated in Figure 4. 2 hL tolerance for 65/ weights is $+ 50.8, D$ 12.7 mm. iu 8

these tolerances is permissible.

accommodate the various bores of tool joints and to maintain a satisfactory cross section in the weld zone after Tnal machining of the assembly.

*These sizes and weights are tentative. Note: See Figure 3.

21

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

22

API SPECIFICATION 5D

Table A-2; ^aUpset Drill Pipe for Weld-on Tool Joints; ^aDimensions and Weights (Group 3) Table Metric (From Table 8)

1 2 3 4 5 6 7 8 9 10 11 12

Calculated Weight

Upset Dimensions, in. e, f Length End of Pipe to Inside Length of Taper Outside Diameter Internal Length of Length of Diameterb at End Upset Internal External Fadeout, +3.18 of Pipe, c +38.10 Taper, Upset, Ext. Upset Max. D0.79 ;À1.59 D12.70 Min. Min. Dou dou 33.34 49.21 66.68 90.49 Liu 88.90 88.90 88.90 88.90 miu ? ? ? ? Leu ? ? ? ? Leu + meu ? ? ? ?

Outside Diameter mm Designationsa Size 27/8 31/2 4 5 Weight D

Wall Thickness in. t mm

Inside Diameter mm d

Plain End kg/m wpe										
Upsetd kg ew										
10.40	13.30	14.00	16.25							
73.02	88.90	101.60	127.00							
0.362	0.368	0.330	0.296							
9.19	9.35	8.38	7.52							
54.64	70.20	84.84	111.96							
Internal-Upset Drill Pipe 14.47 2.45 73.02 18.34 3.36 88.90 19.27										
4.00 107.95 22.16 6.17 127.00 External-Upset Drill Pipe 9.33 2.09 67.46										
14.47 2.82 82.55 18.34 4.63 101.60 21.79 3.72 101.60 19.27 6.54 117.48										
22.32 7.81 131.78 27.84 7.27 131.78 26.70 9.81 146.05 35.80 9.63 149.22										
23/8 27/8 31/2 31/2 4 41/2 41/2 5 5										
6.65 10.40 13.30 15.50 14.00 16.60 20.00 19.50 25.60										
60.32 73.02 88.90 88.90 101.60 114.30 114.30 127.00 127.00										
0.280 0.362 0.368 0.449 0.330 0.337 0.430 0.362 0.500										
7.11 9.19 9.35 11.40 8.38 8.56 10.92 9.19 12.70										
46.10 54.64 70.20 66.10 84.84 97.18 92.46 108.62 101.60										
39.69 49.21 63.50 63.50 77.79 90.49 87.31 100.01 96.84										
107.90 107.90 107.90 107.90 107.90 107.90 107.90 107.90 107.90 107.90										
? ? ? ? ? ? ? ?										
76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20										
139.70 139.70 139.70 139.70 139.70 139.70 139.70 139.70 139.70 139.70										
31/2 41/2 41/2 5 5 51/2 51/2 65/8 65/8										
15.50 16.60 20.00 19.50 25.60 21.90 24.70 25.20 27.70										
88.90 114.30 114.30 127.00 127.00 139.70 139.70 168.28 168.28										
0.449 0.337 0.430 0.362 0.500 0.361 0.415 0.330 0.362										
11.40 8.56 10.92 9.19 12.70 9.17 10.54 8.38 9.19										
66.10 97.18 92.46 108.62 101.60 121.36 118.62 151.52 149.90										
Internal-External-Upset Drill Pipe 21.79 5.03 96.04 49.21 22.32										
3.95 120.65 73.02 27.84 7.99 121.44 71.44 26.70 7.63 131.78 90.49 35.80										
6.99 131.78 84.14 29.52 9.53 146.05 96.84 33.57 8.36 146.05 96.84 33.05										
11.75 177.80 135.00 36.06 10.90 177.80 135.00										
107.90 63.50 107.90 107.90 107.90 107.90 107.90 107.90 107.90 107.90										
76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20										
76.20 38.10 76.20 76.20 76.20 76.20 76.20 76.20 76.20 76.20										
139.70 76.20 139.70 139.70 139.70 139.70 139.70 139.70 139.70 139.70										

aDesignations (Column 1) are shown for the purpose of identification in ordering. bFor internal-upset drill pipe, the tolerance on the outside diameter of the upset, D, shall be 3.18, D 0 mm. A slight external upset within these ou

tolerances is permissible.

cMaximum taper on inside diameter of internal upset and internal-external upset is 20.8 mm/m (2.08%) on diameter. dWeight gain or loss due to end finishing. See 8.4. eThe specified upset dimensions

do not necessarily agree with the bore and OD dimensions of finished weld-on assemblies. Upset dimensions

were chosen to accommodate the various bores of tool joints and to maintain a satisfactory cross section in the weld zone after final machining of the assembly. Final tolerance for 65/ weights is ± 50.8 , D 12.7 mm. Note: See Figure 4.

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

SPECIFICATION FOR DRILL PIPE

23

Table A-3; ^aTolerances on Dimensions and Weights Metric (From Table 9)

Outside Diameter, D Tolerance Size 4 in. and smaller ± 0.79 mm Size 4 1/2 and larger $\pm 1.00\%$ D $\pm 0.50\%$ The following tolerances apply to the outside diameter of the drill pipe body immediately behind the upset for a distance of approximately 127 mm. Measurements shall be made with calipers or snap gages. Pipe Size, OD in. 2.375 D 3.500 4.000 D 5.000 5.500 D 6.625 Tolerances Behind upset or Lo, mm ± 2.38 ± 2.78 ± 3.18 D ± 0.79 D $\pm 0.75\%$ D $\pm 0.75\%$ D Carloads, 18,144 kg or more; $\pm 1.75\%$ Carloads, less than 18,144 kg; $\pm 3.5\%$ Order items, 18,144 kg or more; $\pm 1.75\%$ Order items, less than 18,144 kg; $\pm 3.5\%$ Inside Diameter: d, is governed by the outside diameter and weight tolerances. Upset Dimensions: Tolerances on upset dimensions are given in Tables A-1 and A-2. Eccentricity: Outside Diameter: The maximum eccentricity, measured with a saddle gage (see Figure 5) at a distance of 127 to 152 mm from the end of the upset, shall not exceed 2.36 mm (total indicator reading). Inside Diameter: The maximum eccentricity of the bore of the upset with respect to the outside surface of the drill pipe shall not be more than 1.59 mm (3.18 mm total indicator reading). Ovality: Maximum ovality, measured with a micrometer on outside diameter of upset shall not exceed 2.36 mm.

Wall Thickness, t; $\pm 12.5\%$ Weight; Single lengths; $\pm 6.5\%$; $\pm 3.5\%$ Range Lengths; All lengths in meters

Range: Total range length, incl. a Range length for 95% or more of carload; Permissible variation, max. Permissible length, min. a Range length for 90% or more of carload; Permissible variation, max. Permissible length, min.

1	5.49 D 6.71	0.61	6.10	?	?
2	8.23 D 9.14	?	?	0.61	8.23
3	11.58 D 13.72	?	?	0.91	11.58

^aCarload tolerances shall not apply to order items of less than

18,144 kg of pipe. For any carload of 18,144 kg or more of pipe is shipped to the

Tnal destination without transfer or removal from the car, the tolerance shall apply to each car. For any order item consisting of 18,144 kg or more of pipe that is shipped from the manufacturer's facility by rail, but not to the Tnal destination, the carload tolerance shall apply to the overall quantity of pipe shipped on the order item, but not to individual carloads. bWeight tolerance applies to the calculated weight (or adjusted calculated weight) for the end Tnish speciTed on the purchase order. Where under-thickness tolerances smaller than 12.5 percent are speciTed on the purchase order, the plus tolerance on weight for single lengths shall be increased to 19 percent less the speciTed under-tolerance. (Example: If an under-thickness tolerance of 10 percent is speciTed on the purchase order, the plus tolerance on weight for single lengths is 19 percent minus 10 percent, or 9 percent.)

--``-``-``,,``,,``,,```

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

--``-``-``,,``,,``,,```

Not for Resale

APPENDIX B;^aSUPPLEMENTARY REQUIREMENTS

By agreement between the purchaser and manufacturer and when speciTed on the purchase order, the following supplementary requirements shall apply.

SR2 Nondestructive Inspection (N5 Notch or 1/16-in. Hole)

SR2.1 SUPPLEMENTARY NONDESTRUCTIVE INSPECTION By agreement between purchaser and manufacturer, and when speciTed on the purchase order, drill pipe shall be inspected full length for longitudinal defects by either magnetic particle inspection or by ultrasonic or electromagnetic methods, and on the ends of upset pipe for transverse defects by the magnetic particle method. The location of the equipment shall be at the discretion of the manufacturer; however, the nondestructive inspection must take place after Tnal heat treatment and any subsequent rotary-straightening operation. SR2.2 MAGNETIC PARTICLE INSPECTION When magnetic particle inspection is employed to inspect for longitudinal defects, the entire outside surface and the inside surface for a distance of 6 in. (152.4 mm) shall be inspected. The outside and inside surfaces of the ends of upset pipe shall be inspected for

transverse defects by the magnetic particle method. Magnetic particle inspection of drill pipe may be employed on the inside surface after heat treating and before the ends are cropped. If defects are found, further cropping is permissible provided the inside surface is again inspected by the magnetic particle method, as stipulated above. The depth of all imperfections revealed by magnetic particle inspection shall be determined; and when found to be greater than 5% of the specified wall thickness, the imperfection shall be considered a defect. See SR2.4 for disposition of pipe containing defects. SR2.3 ULTRASONIC OR ELECTROMAGNETIC INSPECTION a. Equipment. Any equipment utilizing the ultrasonic or electromagnetic principles and capable of continuous and uninterrupted inspection of the entire surface of the pipe may be used. The equipment shall be of sufficient sensitivity to indicate defects and shall be checked as prescribed in SR2.3b. b. Reference Standards. A reference standard having the same specified diameter and thickness as the product being inspected shall be used to demonstrate the effectiveness of the inspection equipment and procedures at least once every working turn. The reference standard may be of any convenient length as determined by the manufacturer. It shall be scanned by the inspection unit in a manner stimulating the

25

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

inspection of the product. For ultrasonic inspection, the reference standard shall contain a machined notch as specified in Figure SR-2. For electromagnetic inspection, the reference standard shall contain either a machined notch, as specified in Figure SR-2, or a 1/16-in. (1.6 mm) drilled hole. The notch shall be in the outer surface of the reference standard and parallel to the longitudinal axis of the pipe, except for seamless pipe; and at the option of the manufacturer, the notch may be oriented at such an angle as to optimize detection of anticipated defects. The 1/16-in. (1.6 mm) hole shall be drilled radially through the wall of the reference standard. The inspection equipment shall be adjusted to produce a well-defined indication when the reference standard is scanned by the inspection unit.

Note: The dimensions of the machined notches or drilled holes in these standards should not be construed as the minimum size imperfection detectable by such equipment.

0.04 in. (1 mm) max.

Depth

Depth:a

5%, \pm 15% with min. of 0.012, \pm 0.002 in. (0.3, \pm 0.05 mm) aDepth as a percent of specified wall thickness. For eddy current;^a1.5 in.

10.12. The inspection(s), including forged upsets, shall be performed to the minimum requirements stated in Section 10 as for Grade S-135.

Requirement is specified on the purchase order. Manufacturer's certificate shall state the API Specification and revision date thereof, to which pipe was manufactured. a. Specified diameter, wall thickness, grade, process of manufacture, and type of heat treatment. b. Chemical analyses (heat, product, and recheck) showing the weight percent of all elements whose limits or reporting requirements are set in this specification. c. Test data for all tensile tests required by this specification, including yield strength, ultimate tensile strength, elongation. The type, size, and orientation of specimens shall be shown. d. Impact test results (including the test criteria, and the size, location, and orientation of the test specimen, the nominal test temperature, the absorbed energy measured for each test specimen, the percent shear area, and the average absorbed energy for each test) where such testing is required by the specification. e. Hardness test results (including test type and criterion, and specimen location and orientation), when such testing is required by the purchaser. f. For pipe for which nondestructive inspection is specified by the purchaser (either in the base specification, supplementary requirements, or the purchase order), the method of inspection employed (ultrasonic, electromagnetic, or magnetic particle), and the type and size of the reference standard used. g. Results of any other supplemental testing required by the purchaser. SR15.2 The manufacturer shall establish and follow procedures for maintaining heat and lot identity of all pipe covered by this Supplementary Requirement. The procedures shall provide means for tracing any length of pipe to the proper heat and lot, and to all applicable chemical and mechanical test results.

SR19 Charpy V-Notch Impact Toughness Testing of Group 1 (Grade E-75) Drill Pipe

SR19.1 SUPPLEMENTARY CHARPY V-NOTCH IMPACT TESTING By agreement between the purchaser and the manufacturer, and when specified on the purchase order, Grade E-75 drill pipe shall meet the requirements specified in 6.4 of this specification. SR19.2 TESTING PROCEDURE The test procedure shall be in accordance with the requirements specified in 7.3 of this specification.

SR15 Test Certificates for Oil Country Tubular Goods (OCTG)

SR15.1 The manufacturer shall provide the following data, as applicable, for each item for which this Supplementary

--`-`-`,,`,,`,,`

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

SPECIFICATION FOR DRILL PIPE

27

SR19.3 FREQUENCY OF TESTING;^aGROUP 1 (GRADE E) When SR19 is specified, three Charpy V-notch specimens representing one test shall be taken from one length of drill pipe from each lot of 400 lengths or less of sizes 5 1/2 inches and smaller, and from each lot of 200 lengths or less of size 6 5/8 inches provided that, in the case of heat treated pipe, all lengths have received the same heat treatment. For multiple length seamless pipe a length shall be considered as all of the sections cut from a particular multiple length. SR19.4 IMPACT RETEST If the impact test results fail to meet the requirements in 6.4, the retest provisions on 7.3 shall apply. SR19.5 MARKING Drill pipe tested to this supplementary requirement shall be paint stenciled with the letters SR19 at a location convenient to the manufacturer, but near the grade marking.

testing shall be carried out at 14°F ;À 5°F (D10°C ;À 2.8°C) and shall meet the requirements of SR20.2. SR20.2 CHARPY ENERGY REQUIREMENTS The minimum Charpy V-notch impact energy measured on each of three specimens shall be as listed in Table SR20. The impact energy for each specimen and the average shall be reported. SR20.3 TESTING PROCEDURE

The test procedure shall be in accordance with the requirements specified in 7.3 of this specification. SR20.4 FREQUENCY OF TESTING a. Group 1: The frequency of testing shall be in accordance with SR19.3. b. Group 3: The frequency of testing shall be in accordance with 7.3.4. SR20.5 IMPACT RETEST

SR20 Alternate Low Temperature Charpy V-Notch Impact Toughness Testing of Group 1 (Grade E-75) and Group 3 (Grades X-95, G-105, and S-135) Drill Pipe

SR20.1 ALTERNATE LOW TEMPERATURE CHARPY V-NOTCH IMPACT TESTING By agreement between the purchaser and the manufacturer, and when specified on the purchase order, the Charpy impact

If the impact tests results fail to meet the requirements of SR20.2 the retest, provisions in 7.3.5 shall apply. SR20.6 MARKING Drill pipe tested to this supplementary requirement shall be paint stenciled with the letters SR20 at a location convenient to the manufacturer but near the grade marking.

Table SR20;^aImpact Energy Requirements

1	2	Minimum Average Charpy V-notch Impact Energy of Each Set of Three Specimens ft/lb (J)	30	24	20a	(41)	(33)	(27)	3	Minimum Charpy V-notch Impact Energy of Any Specimen of a Set ft/lb (J)	22	18	15	(30)	(24)	(20)
---	---	---	----	----	-----	------	------	------	---	---	----	----	----	------	------	------

Specimen Size mm x mm 10 x 10.0 10 x 7.5 10 x 5.0

aBased on 67% of full size.

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

--``-``-``,,``,,``,,``

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

--``-``-``,,``,,``,,``

APPENDIX C;^aPURCHASER INSPECTION C.1 Inspection Notice

Where the inspector representing the purchaser desires to inspect this pipe or witness these tests, reasonable notice shall be given of the time when the run is to be made.

C.3 Compliance

The manufacturer is responsible for complying with all of the provisions of this specification. The purchaser may make any investigation necessary to satisfy himself of compliance by the manufacturer and may reject any material that does not comply with this specification.

C.2 Plant Access

The inspector representing the purchaser shall have unrestricted access at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which will concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy that the pipe is being manufactured in accordance with this specification. All inspections should be made at the place of manufacture prior to shipment, unless otherwise specified on the purchase order, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

C.4 Rejection

Unless otherwise provided, material which shows defects on inspection or subsequent to acceptance at the manufacturer's works, or which proves defective when properly applied in service, may be rejected, and the manufacturer so notified. If tests that require the destruction of material are made, any product which is proven not to have met the requirements of the specification shall be rejected. Disposition of rejected product shall be a matter of agreement between the manufacturer and the purchaser.

--``-``-``,,``,,``,,``

29

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

--``-``-``,,``,,``,,```

Not for Resale

APPENDIX D; ^aUSE OF API MONOGRAM MARKING INSTRUCTIONS FOR LICENSEES

D.1 General

Pipe manufactured in conformance with this specification may be marked by the manufacturer as specified hereinafter or specified in Section 11. Products to which the monogram is applied shall be marked per this section. Marking shall be die stamped or paint stenciled or both, as stipulated, unless otherwise agreed on between the purchaser and the manufacturer. The location, size, and sequence of markings shall be as specified in 11.3 and 11.4, except that, at the option of the manufacturer, hot-rolled or hot-stamped markings on pipe and couplings may be substituted for die-stamped markings, and are permitted at intervals along the length. Additional markings, including those for applicable compatible standards, as desired by the manufacturer, or as requested by the purchaser, are not prohibited. Markings shall not overlap; and shall be applied in such manner as not to injure the pipe.

D.2.4 UNFINISHED PIPE Drill pipe furnished with plain ends or end finishes other than the upsets detailed herein, but having the body of the pipe manufactured in accordance with the requirements specified herein, shall be die stamped with the symbol, UF, immediately following the monogram, date, and any applicable compatible standards.

D.2.5 DESIGNATION The size and weight designations are dimensionless quantities based on the former U.S. Customary size and weight per foot. The size designation (Column 1, Tables 7 and 8) shall be paint stenciled. The weight designation, as given in Tables 7 and 8, shall be die stamped and paint stenciled.

D.2.6 GRADE The grade marking shall be die stamped and paint stenciled as follows: Grade E-75

D.2.1 MANUFACTURER; ¹S API LICENSE NUMBER (THE MANUFACTURER; ¹S NAME OR MARK IS OPTIONAL) The manufacturer's API license number shall be die stamped (or paint stenciled, at the option of the manufacturer.) D.2.2

--``-``-``,,``,,``,,```

D.2 Drill Pipe Markings

Markings for pipe and methods of application shall be as follows:

E X G S

Grade X-95 Grade G-105 Grade S-135

D.3 Stamped Markings

Die-stamped markings shall be placed on the outside surface of the upset portion of either end. The size of die stamped markings shall be as follows:

Name: Title: Company: Department: Address: City: Zip/Postal Code:
Telephone: Fax: E-Mail: State/Province: Country:

Quantity Product Number G14F04 G14C07 C50002 C50501 G75002 G07200

Title RP 14F, Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1, and Division 2 Locations RP 14C, Analysis Design, Installation and Testing of Basic Surface Safety Systems on Offshore Production Platforms RP 500, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2 RP 505, Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2 RP 75, Development of a Safety and Environmental Management Program for Outer Continental Shelf Operations and Facilities RP 14J, Design and Hazards Analysis for Offshore Production Facilities

S05

Unit Price \$ 121.00

Total

\$ 143.00 \$ 143.00 \$ 143.00 \$ \$ 99.00 116.00 Subtotal

t Payment Enclosed

t P.O. No. (Enclose Copy)

t Charge My Global Account No. t VISA t MasterCard t American Express
t Diners Club t Discover

Credit Card No.: Print Name (As It Appears on Card): Expiration Date:
Signature:

Applicable Sales Tax (see below) Rush Shipping Fee (see below)

--`-`-`,,`,,`,,`,,`

Shipping and Handling (see below) Total (in U.S. Dollars) 5

To be placed on Standing Order for future editions of this publication, place a check mark in the SO column and sign here: Pricing and availability subject to change without notice.

Mail Orders "C Payment by check or money order in U.S. dollars is required except for established accounts. State and local taxes, \$10 processing fee*, and 5% shipping must be added. Send mail orders to: API Publications, Global Engineering Documents, 15 Inverness Way East, M/S C303B, Englewood, CO 80112-5776, USA. Purchase Orders "C Purchase orders are accepted from established accounts. Invoice will include actual freight cost, a \$10 processing fee*, plus state and local taxes. Telephone Orders "C If ordering by telephone, a \$10 processing fee* and actual freight costs will be added to the order. Sales Tax "C All U.S. purchases must include applicable state and local sales tax. Customers claiming tax-exempt status must provide Global with a copy of their exemption certificate. Shipping (U.S. Orders) "C Orders shipped within the U.S. are sent via traceable means. Most orders are

shipped the same day. Subscription updates are sent by First-Class Mail. Other options, including next-day service, air service, and fax transmission are available at additional cost. Call 1-800-854-7179 for more information. Shipping (International Orders) "C Standard international shipping is by air express courier service. Subscription updates are sent by WorldMail. Normal delivery is 3-4 days from shipping date. Rush Shipping Fee "C Next Day Delivery orders charge is \$20 in addition to the carrier charges. Next Day Delivery orders must be placed by 2:00 p.m. MST to ensure overnight delivery. Returns "C All returns must be pre-approved by calling Global; Customer Service Department at 1-800-624-3974 for information and assistance. There may be a 15% restocking fee. Special order items, electronic documents, and age-dated materials are non-returnable. *Minimum Order "C There is a \$50 minimum for all orders containing hardcopy documents. The \$50 minimum applies to the order subtotal including the \$10 processing fee, excluding any applicable taxes and freight charges. If the total cost of the documents on the order plus the \$10 processing fee is less than \$50, the processing fee will be increased to bring the order amount up to the \$50 minimum. This processing fee will be applied before any applicable deposit account, quantity or member discounts have been applied. There is no minimum for orders containing only electronically delivered documents.

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS Not for Resale

The American Petroleum Institute provides additional resources and programs to industry which are based on API Standards. For more information, contact: ? Training/Workshops ? Inspector Certification Programs ? American Petroleum Institute Quality Registrar ? Monogram Licensing Program ? Engine Oil Licensing and Certification System Ph: 202-682-8490 Fax: 202-962-4797 Ph: 202-682-8161 Fax: 202-962-4739 Ph: 202-682-8574 Fax: 202-682-8070 Ph: 202-962-4791 Fax: 202-682-8070 Ph: 202-682-8233 Fax: 202-962-4739

To obtain a free copy of the API Publications, Programs, and Services Catalog, call 202-682-8375 or fax your request to 202-962-4776. Or see the online interactive version of the catalog on our web site at www.api.org/cat.

Helping You Get The Job Done Right.

01.21.00

--``-``-`,,`,,`,,`,,`

SM

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

Not for Resale

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

--``-``-``,,``,,``,,```

10/01

Not for Resale

Additional copies are available through Global Engineering Documents at (800) 854-7179 or (303) 397-7956 Information about API Publications, Programs and Services is available on the World Wide Web at: <http://www.api.org>

--``-``-``,,``,,``,,```

Product No. G05D05

Not for Resale

Copyright American Petroleum Institute Provided by IHS under license with API No reproduction or networking permitted without license from IHS

±¼TXTÓÉ;°îÄ;â±!;±îÄØ:http://www.mozhua.net/wenkubao