



DRILLING MANUAL

DRILL STRING Inspection and Classification

Section B8
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TABLE B8-1
CLASSIFICATION OF USED DRILL PIPE AND USED TUBING WORK STRINGS
(All Sizes, weights and Grades. Nominal dimension is basis for all calculations)

1	2	3	4	5	6
PIPE CONDITION	CLASS 1 White Band	PREMIUM CLASS ¹ Two White Bands	CLASS 2 Yellow Band	CLASS 3 Blue Band	CLASS 4 Green Band
I. EXTERIOR CONDITIONS					
A. OD Wear					
1. Wall-Uniform	Nominal	Remaining wall not less than 80% due to uniform wear	Remaining wall not less than 80% due to uniform wear	Remaining wall not less than 62.5% due to uniform wear	Remaining wall less than 62.5% due to uniform wear
-Eccentric	Nominal	Remaining wall not less than 80%	Remaining wall not less than 65%	Remaining wall not less than 55%	Remaining wall less than 55%
2. Cross-Sectional Area	Calculated area using nominal dimensions	Not required. If wall thickness is within spec., sufficient area will be present.	Calculated area with not more than 20% uniform wall reduction	Calculated area with not more than 37.5% uniform wall reduction	Calculated area with greater than 37.5% uniform wall reduction
B. Dents & Mashies	None	Not over 3% of OD	Not over 3% of OD	Not over 5.5% of OD	More than 5.5% of OD
C. Slip Area Diameter Variations					
1. Crushing ²	None	Not over 3% of OD	Not over 3% of OD	Not over 5.5% of OD	More than 5.5% of OD
2. Necking	None	Not over 3% of OD	Not over 3% of OD	Not over 5.5% of OD	More than 5.5% of OD
D. Stress Induced Diameter Variations					
1. Stretched	None	Not over 3% of OD reduction	Not over 3% of OD reduction	Not over 5.5% of OD reduction	More than 5.5% of OD reduction
2. String Shot	None	Not over 3% of OD increase	Not over 3% of OD increase	Not over 4.5% of OD increase	More than 4.5% of OD increase
E. Cuts, Gouges and Corrosion					
1. Round Bottom	None	Remaining wall not less than 80%	Remaining wall not less than 80%	Remaining wall not less than 62.5%	Remaining wall less than 62.5%
2. Sharp Bottom					
a. Longitudinal	None	Remaining wall not less than 80%	Remaining wall not less than 80%	Remaining wall not less than 62.5%	Remaining wall less than 62.5%
b. Transverse ³	None	Remaining wall not less than 90% and length not over 10% of circumference	Remaining wall not less than 90% and length not over 10% of circumference	Remaining wall not less than 80% and length not over 10% of circumference	Remaining wall less than 80% and length greater than 10% of circumference
3. Sharp Bottom, Slip Area Only					
a. Transverse	None	Remaining wall not less than 90%. Gouge may be ground out along the longitudinal axis not to exceed 1 1/2 in.	Remaining wall not less than 90%. Gouge may be ground out along the longitudinal axis not to exceed 2 1/2 in.	Remaining wall not less than 80%. Gouge may be ground out along the longitudinal axis not to exceed 3 1/2 in.	---
F. Fatigue Cracks⁴	None	None	None	None	None
II. INTERIOR CONDITIONS					
A. Corrosive Pitting					
1. Wall	Nominal	Remaining wall not less than 80% measured from base of deepest pit.	Remaining wall not less than 65% measured from base of deepest pit.	Remaining wall not less than 55% measured from base of deepest pit.	Remaining wall less than 55% measured from base of deepest pit.
2. Cross Sectional Area	Calculated area using nominal dimensions	Not required. If wall thickness is within spec., sufficient area will be present.	Calculated area with not over 20% uniform wall reduction	Calculated area with not over 37.5% uniform wall reduction	Calculated area with greater than 37.5% uniform wall reduction
B. Erosion and Wear					
1. Wall	Nominal	Remaining wall not less than 80%	Remaining wall not less than 65%	Remaining wall not less than 55%	Remaining wall less than 55%
2. Cross Sectional Area	Calculated area using nominal dimensions	Not required. If wall thickness is within spec., sufficient area will be present.	Calculated area with not over 20% uniform wall reduction	Calculated area with not over 37.5% uniform wall reduction	Calculated area with greater than 37.5% uniform wall reduction
C. Fatigue Cracks⁴	None	None	None	None	None

¹The premium classification is recommended for service where it is anticipated that torsional limits for Class 2 drill pipe and tubing work strings will be exceeded. The torsional limits for Premium Class and Class 2 drill pipe are specified in Tables B3-2 and B3-3, respectively. Premium Class shall be identified with two white bands, plus one center punch mark on the 35° sloping shoulder of the tool joint pin (or the 18° sloping shoulder of the pin, if the 18° angle is furnished.)

²Inspection of this condition should be made to detect presence of longitudinal and transverse cracks inside and outside.

³May be ground out along longitudinal axis not to exceed value for round bottom cuts or gouges as shown in I.E. 1 of this table and such grinding to be approximately faired into outer contour of the pipe.

⁴In any classification where fatigue cracks or washouts appear, the pipe will be identified with the red band and considered unfit for further drilling service.

NOTE: Rubber drill pipe/casing protectors or similar devices must be removed from pipe O.D. before attempting these inspections.



Table E3-1 — NEW DRILL PIPE — TORSIONAL, TENSILE, COLLAPSE AND INTERNAL PRESSURE DATA

Size OD in.	Nom. Wt. New Pipe w/T.J.	Torsional Data *				Tensile Data Based on Minimum Values Load at the Minimum Yield Strength, lb.				Collapse Pressure Based On Minimum Values, psi.				Internal Pressure At Minimum Yield Strength, psi.			
		Torsional Yield Strength, ft-lb				E				E				E			
		X-95	G-105	S-135		X-95	G-105	S-135		X-95	G-105	S-135		X-95	G-105	S-135	
2 3/8	4.85	4760	6030	6670	8570	97820	123900	136940	176970	11040	13980	15460	19070	10500	43300	14700	18900
	6.65	6250	7920	8750	11250	138220	175080	193500	248790	15600	19760	21840	28080	15470	19600	21560	27850
2 7/8	6.85	8080	10240	11320	14550	135900	172140	190260	244620	10470	12930	14010	17060	9910	12550	13870	17830
	10.40	11550	14640	16180	20800	214340	271500	300080	385820	16510	20910	23110	29720	16530	20930	23140	29750
3 1/2	9.50	14150	17920	19800	25460	194270	246070	271970	349680	10040	12060	13050	15780	9520	12070	13340	17150
	13.30	18550	23500	25970	33390	271570	343990	380190	488820	14110	17880	19760	25400	13800	17480	19320	24840
4	15.50	21090	26710	29520	37950	322780	408850	451890	581000	16770	21250	23480	30190	16840	21330	23570	30310
	11.85	19470	24670	27260	35050	230750	292290	323050	415350	8410	9960	10700	12650	8600	10890	12040	15480
4 1/2	14.00	23290	29500	32600	41920	285360	361460	399500	513650	11350	14380	15900	20170	10830	13720	15160	19490
	15.70	25810	32690	36130	46460	324120	410550	453770	583420	12900	16340	18050	23210	12470	15790	17460	22440
5	13.75	25910	32820	36270	46630	270030	342040	378040	486050	7200	8400	8950	10310	7900	10010	11070	14230
	16.60	30810	39020	43130	55450	330560	418700	462780	595000	10390	12750	13820	16800	9830	12450	13760	17690
5 1/2	20.00	36900	46740	51660	66420	412360	522320	577300	742240	12960	16420	18150	23330	12540	15890	17560	22580
	22.82	40910	51820	57280	73640	471240	596900	659740	848230	14810	18770	20740	26670	14580	18470	20420	26250
5 3/4	16.25	35040	44390	49060	63080	328070	415560	459400	590530	6970	8090	8610	9860	7770	9840	10680	13990
	19.50	41170	52140	57600	74100	395600	501090	553830	712070	10000	12010	12990	15700	9500	12040	13300	17110
5 1/2	25.60	52260	66190	73160	94060	530150	671520	742200	954260	13500	17100	18900	24300	13120	16620	18380	23620
	19.20	44070	55830	61700	79330	372180	471430	521050	669920	6070	6930	7300	8120	7250	9190	10160	13060
5 5/8	21.90	50710	64230	70990	91280	437120	553680	611960	786810	8440	10000	10740	12710	8610	10910	12060	15510
	24.70	56570	71660	79200	101830	497220	629810	696110	895000	10460	12920	14000	17050	9900	12540	13860	17830
5 5/8	25.20	70580	89400	98810	127050	489470	619990	685250	881040	4810	5310	5490	6040	6540	8280	9150	11770

*Based on the shear strength equal to 57.7% of minimum yield strength and nominal wall thickness.
NOTE: Calculations are based on formulae in AISC Specification.

Calculations are based on formulas in Appendix A, API RP7G. Table is based on API RP7G, Tables 2.2 and 2.3.



DRILLING MANUAL

STEEL DRILL PIPE Specifications

Section B3
Page 1

I. General Information

Drill pipe is used to transmit power by rotary motion from ground level to a drilling bit at the bottom of the hole and to convey flushing media to the cutting face of the tool. Thus it plays a vital part in the successful drilling of oil and gas wells.

With the exception of specialty tools, it is probable that no other part of the drill stem is subjected to the complex stresses which drill pipe must withstand. For this reason, the combined skill of steel industry engineers, with full cooperation by oil companies and drilling contractors and in conjunction with the API and IADC, has been used in the development of this vital tool. The same skill was utilized in formulating suggested practices in the care and handling of pipe on the surface, while making trips in the hole and while drilling. By utilizing this compiled information contractors and operators alike may take full advantage of these developments and realize optimum economics by extended life of the pipe. An important consideration is that drill pipe is an important and expensive part of the total rig with relatively short life. The cost of the pipe places it in the category of a capital investment and not strictly expendable. A recommended practice, followed by many contractors, is to identify each joint upon purchase. In turn a recording should be made, along with its length, when it is placed in the string. By this means, and with some effort in the field and through office accounting, the following is made possible:

1. Useful life of the joint may be determined.
2. Type of service and/or stresses to which it is subjected may be recorded.
3. Switching within the string to obtain optimum use.
4. Determine causes of failures with greater accuracy.
5. Prevent or minimize downhole failures.

Too little of this type of feed back information is available. The more of this kind of data which is accumulated, the more assistance industry experts could be to the users. Results would be more economical operation for the contractor and cheaper holes for the operator.

II. Grades of and Lengths of Steel Drill Pipe

Drill pipe is furnished in the following API length ranges:

Range 1	18 ft. to 22 ft.
Range 2	27 ft. to 30 ft.
Range 3	38 ft. to 45 ft.

Seamless drill pipe is offered in the grades listed below under "Mechanical Properties - A.P.I. Steel Drill Pipe".

III. Physical Data For Steel Drill Pipe

Most of the tables in this manual and in API Specifications and Recommended Practices are based on minimum yield strength values for each grade of drill pipe. In combination with the dimensional data given in Table B8-2 of Section B8, the minimum yield strength values are used to develop tables for new through Class 3 used pipe. These include Tables B1-1 through B1-5, B1-7, B3-1 through B3-4, and Table Q1-1 in Section Q, concerning stuck drill pipe.

In addition, for design purposes, yield characteristics in the slip area for new or like-new cross-sectional areas are shown in Table B3-5.

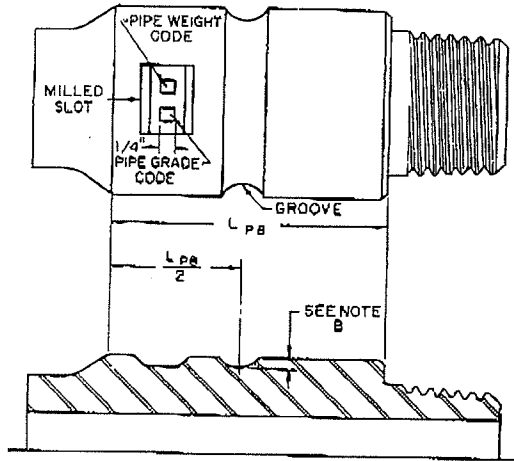
IV. Marking

Drill pipe identification is marked at the base of the pin by the tool joint manufacturer after the pin is affixed. The marking will be in accordance with Figure B1-3. Also it is recommended that drill pipe other than standard weight Grade E, be marked according to Figure B1-4. This is to give the crew rapid identification of high strength drill pipe on the racks and on the floor during trips when it is in a combination string with Grade E. With little trouble, if necessary cleaning out the milled slot, the specific grade and weight can be determined from the stenciled figures.

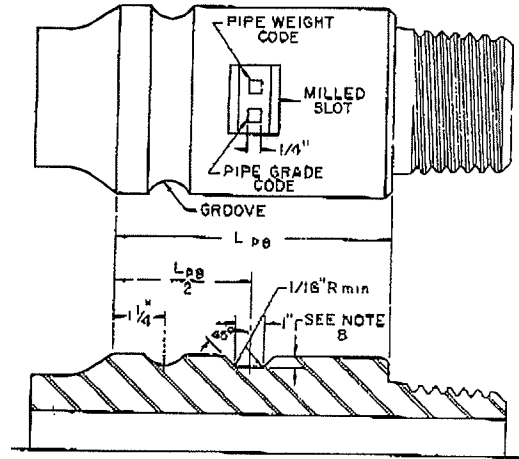
MECHANICAL PROPERTIES — API STEEL DRILL PIPE

Grade.....	E	95(X)	105(G)	135(S)
Yield Strength (minimum psi)	75,000	95,000	105,000	135,000
Yield Strength (maximum psi)	105,000	125,000	135,000	165,000
Tensile Strength (minimum psi)	100,000	105,000	115,000	145,000

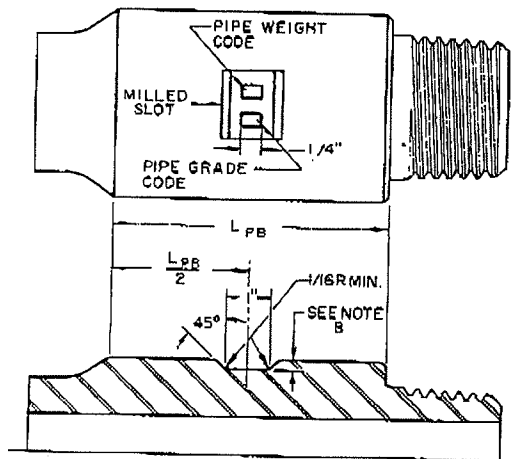
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STANDARD WEIGHT
HIGH STRENGTH DRILL PIPE



HEAVY WEIGHT
HIGH STRENGTH DRILL PIPE



HEAVY WEIGHT
GRADE E DRILL PIPE

DRILL PIPE GRADE CODE

STANDARD GRADES

Grade	Symbol
N-80	N
E	E
C-75	C

HIGH STRENGTH
GRADES

Grade	Symbol
X-95	X
G-105	G
S-135	S
V-150	V

DRILL PIPE WEIGHT CODE

1	2	3	4
Size, OD inches	Nominal Wt. lb per ft	Wall Thickness inches	Weight Code Number
2 1/4	4.85 6.65*	.190 .280	1 2
2 3/4	6.85 10.40*	.217 .362	1 2
3 1/2	9.50 13.30* 15.50	.254 .368 .449	1 2 3
4	11.85 14.00* 15.70	.262 .330 .380	1 2 3
4 1/2	13.75 16.60* 20.00 22.82 24.66 25.50	.271 .337 .430 .500 .550 .575	1 3 3 4 5 6
5	16.25 19.50* 25.60	.296 .362 .500	1 2 3
5 1/2	19.20 21.90* 24.70	.304 .361 .415	1 2 3
6	25.20*	.330	2

*Designates standard weight for drill pipe size.

NOTE A: Standard weight Grade E drill pipe designated by an asterisk (*) in the drill pipe weight code will have no groove or milled slot for identification. Grade E heavy weight drill pipe will have a milled slot only, in the center of the tong space.

NOTE B: Groove radius approximately 3/8 inch. Groove and milled slot to be 1/4 in. deep on 5 1/4 in. OD and larger tool joints, 3/16 in. deep on 5 in. OD and smaller tool joints.

NOTE C: Stencil the grade code symbol and weight code number corresponding to grade and weight of pipe in milled slot of pin. Stencil with 1/4 in. high characters so marking may be read with drillpipe hanging in elevators.

L_{PB} = Pin Tong Space Length (See Table 4.2, API Spec 7).

RECOMMENDED PRACTICE FOR MILL SLOT AND GROOVE METHOD
OF DRILL STRING IDENTIFICATION

FIGURE B1-4