ZAO VNIITneft
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Private Stock Company

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DRILL PIPE

OPERATION MANUAL

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This Manual covers the range of drill pipe manufactured to GOST R 50278, API Spec 5DP, specifications (TU) applied at the mills of Pipe Metallurgical Company (OAO TMK).

All the drill pipe may be used for construction and repair of oil and gas wells provided the recommendations given below are considered

The Manual neither supersedes nor disagrees with the existing guidelines listed in the Annex C, but supplements and gives specific details for proper use of drill pipe manufactured at the mills of OAO TMK. This Manual supersedes the document issued by ZAO VNIITneft in 2005.

The Manual covers all the substantial requirements for industrial safety in the course of drill pipe use in the petroleum and natural gas industries.

Data contained herein were taken from pipe specifications and are provided for general reference. For detailed technical data refer to applicable normative specifications for specific pipe.

OAO TMK guarantees reliability and quality of the pipe used provided all the requirements of this Manual are observed.

1 TERMS AND DEFINITIONS

For the purposes of this Manual, the following terms and definitions apply:

Product – drill pipe.

Drill pipe (DP) – drill pipe body with tool joints welded on using friction-welding process.

Tool joint – component used to connect drill pipe lengths to form a drill string. Tool joint pin is connected to one drill pipe end, the tool joint box is connected to the other pipe end. In this case, tool joint parts are welded to drill pipe body.

Tool joint box – threaded connection on tool joints that has internal threads.

Tool joint pin – threaded connection on tool joints that has external threads.

Drill string – drill pipe lengths made up sequentially.

Supplier – firm, company, organization that confirms and bears responsibility for the compliance of the product supplied with all the certificate data and requirements of specifications, state standards (GOSTs) and other technical documentation.

Purchaser – firm, company, organization that purchases or uses the product.

Pipe size designation – pipe designation that denotes its application, pipe type, upset type, pipe body outside diameter, wall thickness, pipe length, elevator shoulder type, pipe grade or steel grade.

Drill pipe set – set of drill pipe lengths of the same size designation manufactured at the same time and having one certificate issued by the operating organization.

Acceptance – process of measuring, examining, testing, gauging or otherwise comparing a unit of product with the applicable requirements.

Normative documents for manufacture and supply of tubular products – standards, specifications, technical appendices to agreements (contracts) for pipe manufacture and supply.

Visual inspection – organoleptic examination by organs of vision.

Check measurements – inspection performed using measuring instruments.

Pipe wear and tear – change of pipe geometry and strength (performance) properties in the course of operation.

Full wear-out – change of pipe geometry and strength (performance) properties in the course of operation that prevents further intended pipe use.

Defect – imperfection of sufficient magnitude to warrant rejection of the product based on criteria defined in the applicable normative document.

Lot – definite quantity of product manufactured under conditions that are considered uniform for the attribute to be inspected.

Lot size – number of product units in a lot.

Drill pipe manufacturer – enterprise that is responsible for pipe compliance with all the requirements of applicable normative documents whose trademark is applied to the product.

2 PIPE SPECIFICATIONS

2.1 For the range of pipe manufactured at the mills of TMK company refer to Table 1.

Table 1 - Range of drill pipe manufactured at the mills of TMK company

Normative Document	Pipe Dimensions, mm		Pipe Grade	Tool Joint Type	Upset Type	Pipe Length, m
	Specified Outside Diameter	Wall Thickness				
1	2	3	4	5	6	7
GOST R 50278-92 Drill pipe with welded-on tool joints. Specification. **TU 14-3-1571-2008/ TU U 27.2-05757883-200:2008** Drill pipe with welded-on tool joints.	60.3	7.1 (7.11)	Д, Е, Л, М	ЗП- 86-44	External Upset – EU	8.0-8.6 9.0-9.45 11.9-12.5
	73.0	9.2 (9.19)	Д, Е	ЗП-105-54		
			Л, М	ЗП-105-51		
			Р	ЗП-111-41		
	88.9	9.4 (9.35)	Д, Е	ЗП-121-68		
			Л	ЗП-127-65		
			М	ЗП-127-62		
			Р	ЗП-127-54		
		11.4	Д, Е	ЗП-127-65		
			Л	ЗП-127-62		
			М	ЗП-127-54		
			Р	ЗП-140-57		
	101.6	8.4 (8.38)	Д, Е, Л, М	ЗП-152-83		
			Р	ЗП-152-76		
	114.3	8.6 (8.56)	Д, Е, Л, М	ЗП-162-95-1		
			Р	ЗП-162-89-1		
		10.9 (10.92)	Д, Е	ЗП-162-92		
			Л М	ЗП-162-89-1		
			Р	ЗП-168-76		
	127.0	9.2 (9.19)	Д, Е, Л	ЗП-178-102		
		12.7	Д, Е	ЗП-178-102		
			Л	ЗП-178-95		

Table 1 (continued)

1	2	3	4	5	6	7
GOST R 50278-92 Drill pipe with welded-on tool joints. Specification. **TU 14-3-1571-2008/ TU U 27.2-05757883-200:2008** Drill pipe with welded-on tool joints.	88.9	9.4 (9.35)	Д, Е	ЗП-108-44	Internal Upset – IU	8.0-8.6 9.0-9.45 11.9-12.5
		11.4	Д, Е	ЗП-108-41		
	101.6	8.4 (8.38)	Д, Е	ЗП-133-71		
			Л	ЗП-133-68		
			М	ЗП-140-62		
			Р	ЗП-140-51		
	114.3	8.6 8.56)	Д, Е	ЗП-159-83	Internal-External Upset – IEU	
			Л, М	ЗП-159-76		
			Р	ЗП-159-70		
		10.9 (10.92)	Д, Е	ЗП-159-76		
			Л	ЗП-159-70		
			М	ЗП-159-63		
			Р	ЗП-159-57		
	127.0	9.2 (9.19)	Д, Е	ЗП-162-95-2		
			Л	ЗП-162-89-2		
			М	ЗП-165-83		
			Р	ЗП-168-70		
		12.7	Д, Е	ЗП-162-89-2		
			Л	ЗП-165-76		
			М	ЗП-168-70		
			Р	ЗП-184-83		
	139.7	9.2	Д, Е	ЗП-178-102		
			Л	ЗП-178-95		
			М	ЗП-184-89		
			Р	ЗП-190-76		
		10.5	Д, Е	ЗП-178-102		
			Л, М	ЗП-184-89		
			Р	ЗП-190-76		
Note: specified wall thickness shown in parentheses is given for pipe according to TU 14-3-1571:2008						
API Spec 5DP Specification for Drill Pipe.	101.60	8.38	E; X; G; S	NC 40	Internal Upset – IU	8.84-9.75 12.19-13.1
	60.32	7.11	E; X; G	NC 26	External Upset – EU	
	73.02	9.19	E; X; G; S	NC 31		
	88.90	6.45	E	NC 38		
		9.35	E; X; G; S			
		11.40	E; X; G			
		11.40	S	NC 40		
	101.60	8.38	E; X; G; S	NC 46		
	114.30	8.56; 10.92	E; X; G; S	NC 50		
	114.30	6.88	E	NC 46	Internal-External Upset – IEU	
		8.56; 10.92	E; X; G; S			
	127.00	9.19	E; X; G; S	NC 50		
		12.7	E; X; G			
		12.7	S	5½ FH		
	139.70	9.17; 10.54	E; X; G; S			
	168.28	8.38; 9.19	E; X; G; S	6⅝ FH		

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-141-94 Drill pipe with welded-on tool joints of reduced diameter БК-114	114.3	8.6	Д, Е, Л, М	ЗП-146-70/76	Internal-External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
		10.9	Д, Е	ЗП-146-70/70		
		10.9	Л	ЗП-146-63/70		
TU 1324-138-00147016-02 Process drill pipe and tool joints for them	60.3	5.0	Д, Е	З-86-48	Internal-External Upset – IEU	$10.0^{-0.8}$
				ЗР-86-48		
	73.0	5.5	Д, Е	З-95-58		
				З-98-59		
				ЗР-98-59		
		6.5	Д, Е, Л	З-98-57		
				ЗР-98-57		
				З-105-57		
				ЗР-105-57		
	88.9	6.5	Д, Е, Л	З-121-73		
				ЗР-121-73		
	101.6	6.5	Д, Е, Л	З-133-86		
				ЗР-133-86		
TU 14-161-137-94 Drill pipe 60-89 mm in diameter with welded-on tool joints	60.3	7.0	Д, Е	ЗП-77-34	Internal-External Upset – IEU, Internal Upset – IU and External Upset – EU	8.0-8.4 9.0-9.45 11.9-12.5
			Л	ЗП-77-33		
	73.0	7.0	Д	ЗП-86-45		
		9.0	Д, Е, Л, М	ЗП-105М-45		
		9.19	Д, Е, Л	ЗП-105М-51		
			М	ЗП-105М-50		
	76	8.5	Д, Е	ЗП-105М-54		
	88.9	8.0	Д, Е	ЗП-108М-45		
				ЗП-105-53		
			Д, Е, Л	ЗП-121М-68		
		6.5	Д, Е	ЗП-121М-73		
TU 14-161-138-94 Drill pipe БК-127 127 mm in diameter with welded-on tool joints	127.0	9.2	Д, Е	ЗП-162-92	Internal-External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
			Л	ЗП-165-86		
			М	ЗП-168-83		
		12.7	Д, Е	ЗП-168-83		
			Л	ЗП-168-76		
TU 14-3-1849-92 Drill pipe БК-73 73 mm in diameter with welded-on tool joints	73.0	9.0	Д, Е	ЗП-92-34	Internal-External Upset – IEU	8.0-8.4 9.0-9.45 11.9-12.5
TU 14-161-217-2003 Flush-joint light-weight drill pipe of small diameter	73.0	5.5	Д, Е, Л	ЗП-95-62	External Upset – EU	8.0-8.4 9.0-9.45 11.9-12.5

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-219-2004 Drill pipe with welded-on tool joints (high-torque)	50.0	5.5	Д, Е, Л	ЗП-65-25	Internal-External Upset – IEU, Internal Upset – IU and External Upset – EU	8.0-8.6 9.0-9.45 11.9-12.5
	60.3	7.0	Д, Е	ЗП-77-34 ЗПР-77-34		
			Л	ЗП-77-33 ЗПР-77-33		
			Е, Л	ЗП-79-33 ЗПР-79-33		
	73.0	9.19	Е, Л, М	ЗП-100-51 ЗПР-100-51		
			Е, Л, М, Н, Р	ЗП-105-51-1 ЗПР-105-51-1		
	88.9	8.0	Е, Л, М	ЗП-105-51-2 ЗПР-105-51-2		
			Е, Л, М	ЗП-108-51-2 ЗПР-108-51-2		
	88.9	11.4	Д, Е, Л	ЗП-105-51-2 ЗПР-105-51-2		
			Д, Е, Л	ЗП-108-51-2 ЗПР-108-51-2		
	88.9	11.4	Л, М, Н	ЗП-127-54 ЗПР-127-54		
	127.0	9.19	Е, Л, М	ЗП-165-89-1 ЗПР-165-89-1		
	127.0	15.0	Д, Е, Л	ЗП-165-89-2		
TU 14-161-235-2009 Drill pipe with welded-on tool joints TMK TDS	60.3	7.1	Д, Е, Л, М	TMK TDS-86-44 TMK TDSM-86-44	External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
	73.0	9.2	Д, Е, Л, М	TMK TDS-105-54 TMK TDSM-105-54		
			Л, М	TMK TDS-105-51 TMK TDSM-105-51		
	88.9	9.4	Л, М	TMK TDS-127-65 TMK TDSM-127-65		
			М, Р	TMK TDS-127-62 TMK TDSM-127-62		
			Р	TMK TDS-127-54 TMK TDSM-127-54		
		11.4	Д, Е, Л	TMK TDS-127-65 TMK TDSM-127-65		
			Л, М	TMK TDS-127-62 TMK TDSM-127-62		
			М, Р	TMK TDS-127-54 TMK TDSM-127-54		
	101.6	8.4	Д, Е, Л, М, Р	TMK TDS-152-83 TMK TDSM-152-83		
			Р	TMK TDS-152-76 TMK TDSM-152-76		
	114.3	8.6	Д, Е, Л, М	TMK TDS-162-95-1 TMK TDSM-162-95-1		
			Р	TMK TDS-162-89-1 TMK TDSM-162-89-1		
		10.9	Д, Е	TMK TDS-162-92 TMK TDSM-162-92		
			Л, М, Р	TMK TDS-162-89-1 TMK TDSM-162-89-1		
			Р	TMK TDS-168-76 TMK TDSM-168-76		

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-235-2009 Drill pipe with welded-on tool joints TMK TDS	127.0	9.2	Д, Е, Л, М, Р	TMK TDS-178-102 TMK TDSM-178-102	External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
		12.7	Д, Е	TMK TDS-178-102 TMK TDSM-178-102		
			Л, М, Р	TMK TDS-178-95 TMK TDSM-178-95		
	73.0	9.2	Д, Е	TMK TDS-92-34 TMK TDSM-92-34	Internal Upset – IU	
	88.9	9.4	Д, Е	TMK TDS-108-44 TMK TDSM-108-44		
		11.4	Д, Е	TMK TDS-108-41 TMK TDSM-108-41		
	101.6	8.4	Л, М	TMK TDS-133-68 TMK TDSM-133-68		
			М, Р	TMK TDS-140-62 TMK TDSM-140-62		
	114.3	8.6	Д, Е	TMK TDS-159-83 TMK TDSM-159-83	Internal-External Upset– IEU	
			Л, М	TMK TDS-159-76 TMK TDSM-159-76		
			Р	TMK TDS-159-70 TMK TDSM-159-70		
		10.9	Д, Е	TMK TDS-159-76 TMK TDSM-159-76		
			Л, М, Р	TMK TDS-159-70 TMK TDSM-159-70		
	127.0	9.2	Д, Е	TMK TDS-162-95-2 TMK TDSM-162-95-2		
			Л, М	TMK TDS-162-89-2 TMK TDSM-162-89-2		
			М, Р	TMK TDS-165-83 TMK TDSM-165-83		
		12.7	Д, Е	TMK TDS-162-89-2 TMK TDSM-162-89-2		
			Л, М	TMK TDS-165-76 TMK TDSM-165-76		
	60.3	7.11	Е, Х, G	TMK TDSA-86-44 TMK TDSAM-86-44	External-Upset – EU	
	73.0	9.19	Е, Х, G	TMK TDSA-105-54 TMK TDSAM-105-54		
			Х, G	TMK TDSA-105-51 TMK TDSAM-105-51		
	88.9	9.35	Х, G	TMK TDSA-127-65 TMK TDSAM-127-65		
			G, S	TMK TDSA-127-62 TMK TDSAM-127-62		
			S	TMK TDSA-127-54 TMK TDSAM-127-54		
		11.4	Е, Х	TMK TDSA-127-65 TMK TDSAM-127-65		
			Х, G	TMK TDSA-127-62 TMK TDSAM-127-62		
			G, S	TMK TDSA-127-54 TMK TDSAM-127-54		
	101.6	8.38	Е, Х, G, S	TMK TDSA-152-83 TMK TDSAM-152-83		
			S	TMK TDSA-152-76 TMK TDSAM-152-76		

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-235-2009 Drill pipe with welded-on tool joints TMK TDS	114.3	8.56	E	TMK TDSA-162-95-1 TMK TDSAM-162-95-1	External-Upset – EU	8.0-8.6 9.0-9.45 11.9-12.5
			X, G	TMK TDSA-168-95-1 TMK TDSAM-168-95-1		
			S	TMK TDSA-168-89-1 TMK TDSAM-168-89-1		
		10.92	E, X	TMK TDSA-162-92 TMK TDSAM-162-92		
			E, X	TMK TDSA-168-92 TMK TDSAM-168-92		
			X, G, S	TMK TDSA-168-89-1 TMK TDSAM-168-89-1		
			S	TMK TDSA-168-76-1 TMK TDSAM-168-76-1		
	127.0	9.19	E, X	TMK TDSA-178-102 TMK TDSAM-178-102		
		12.7	E	TMK TDSA-178-102 TMK TDSAM-178-102		
			X	TMK TDSA-178-95 TMK TDSAM-178-95		
	101.6	8.38	X, G	TMK TDSA-133-68 TMK TDSAM-133-68	Internal Upset – IU	
			G, S	TMK TDSA-140-62 TMK TDSAM-140-62		
	114.3	8.56	E	TMK TDSA-159-83 TMK TDSAM-159-83	Internal-External-Upset – IEU	
			X, G	TMK TDSA-159-76 TMK TDSAM-159-76		
			S	TMK TDSA-159-70 TMK TDSAM-159-70		
		10.92	E	TMK TDSA-159-76 TMK TDSAM-159-76		
			X, G, S	TMK TDSA-159-70 TMK TDSAM-159-70		
	127.0	9.19	E	TMK TDSA-168-95-2 TMK TDSAM-168-95-2		
			X, G	TMK TDSA-168-89-2 TMK TDSAM-168-89-2		
			G, S	TMK TDSA-168-83 TMK TDSAM-168-83		
			X, G, S	TMK TDSA-178-95 TMK TDSAM-178-95		
		12.7	E	TMK TDSA-168-89-2 TMK TDSAM-168-89-2		
			X, G	TMK TDSA-168-76-2 TMK TDSAM-168-76-2		
			G, S	TMK TDSA-184-89 TMK TDSA-184-89		

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-157-107-2009 Drill pipe with welded-on tool joints TMK TDS	114.3	8.6	Д, Е, Л, М	TMK TDS-162-95-1 TMK TDSM-162-95-1	External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
		10.9	Д, Е	TMK TDS-162-92 TMK TDSM-162-92		
			Л, М	TMK TDS-162-89-1 TMK TDSM-162-89-1		
	127.0	9.2	Д, Е, Л, М	TMK TDS-178-102		
		12.7	Д, Е	TMK TDS-178-102		
			Л, М	TMK TDS-178-95		
	114.3	8.6	Д, Е	TMK TDS-159-83 TMK TDSM-159-83	Internal-External Upset – IEU	
			Л, М	TMK TDS-159-76 TMK TDSM-159-76		
		10.9	Д, Е, Л, М	TMK TDS-159-76 TMK TDSM-159-76		
			Л, М	TMK TDS-159-70 TMK TDSM-159-70		
	127.0	9.2	Д. Е, Л	TMK TDS-162-95-2 TMK TDSM-162-95-2		
			Л, М	TMK TDS-162-89-2 TMK TDSM-162-89-2		
			М	TMK TDS-165-83 TMK TDSM-165-83		
	127.0	12.7	Д, Е, Л	TMK TDS-162-89-2 TMK TDSM-162-89-2		
			Л, М	TMK TDS-165-76 TMK TDSM-165-76		
	139.7	9.2	Д, Е, Л, М	TMK TDS-178-102		
			Л, М	TMK TDS-178-95		
			М	TMK TDS-184-89		
		10.5	Д, Е, Л, М	TMK TDS-178-102		
			Л, М	TMK TDS-184-89		
	114.3	8.56	Е, Х, G	TMK TDSA-168-95-1 TMK TDSAM-168-95-1	External Upset – EU	
			S	TMK TDSA-168-89-1 TMK TDSAM-168-89-1		
		10.92	Е	TMK TDSA-168-92 TMK TDSAM-168-92		
			Х, G, S	TMK TDSA-168-89-1 TMK TDSAM-168-89-1		
			S	TMK TDSA-168-76-1 TMK TDSAM-168-76-1		
	114.3	8.56	Е	TMK TDSA-159-83 TMK TDSAM-159-83	Internal-External Upset – IEU	
			Х, G, S	TMK TDSA-159-76 TMK TDSAM-159-76		
			S	TMK TDSA-159-70		
				TMK TDSAM-159-70		
		10.92	Е, Х, G	TMK TDSA-159-76 TMK TDSAM-159-76		
			Х, G, S	TMK TDSA-159-70 TMK TDSAM-159-70		

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-157-107-2009 Drill pipe with welded-on tool joints TMK TDS	127.0	9.19	E, X	TMK TDSA-168-95-2	Internal-External Upset – IEU	8.0-8.6 9.0-9.45 11.9-12.5
				TMK TDSAM-168-95-2		
			X, G	TMK TDSA-168-89-2		
				TMK TDSAM-168-89-2		
			G, S	TMK TDSA-168-83		
				TMK TDSAM-168-83		
			X, G, S	TMK TDSA-178-95		
		12.70	E,	TMK TDSA-168-89-2		
				TMK TDSAM-168-89-2		
			X, G	TMK TDSA-168-76-2		
				TMK TDSAM-168-76-2		
			G, S	TMK TDSA-184-89		
	139.7	9.17	E, X, G	TMK TDS-178-102		
			X, G, S	TMK TDS-178-95		
		10.54	E, X, G	TMK TDS-178-102		
			X, G, S	TMK TDSA-184-89		
TU 14-161-221-2005 Drill pipe with welded-on tool joints of X95S grade in H_2S-resistant version	88.9	9.35	X95S	NC 38 (OD 127.0 x ID 65.09)	External Upset – EU	8.0-8.4 9.0-9.45 11.9-12.5
	127.0	9.19	X95S	NC 50 (OD 168.28 x ID 88.9)	Internal-External Upset – IEU	
Note: tool joints 3ПР, TMK TDSM and TMK TDSAM differ from the standard tool joints 3П, TMK TDS and TMK TDSA in longer tongs area.						

2.2 For mechanical metal properties of pipe bodies and tool joints according to GOST, TU and API refer to Tables 2, 3, 4.

Table 2 – Mechanical Metal Properties of Pipe Bodies according to GOST and TU

Parameter	Grade						
	Д	Е	Х95S	Л	М	Н	Р
1	2	3	4	5	6	7	8
Ultimate tensile strength σ_U, MPa (kgf/mm^2), min.	655(66.8)	689(70.3)	724(73.8)	724(73.8)	792(80.8)	885(90.2)	999(101.8)
Yield strength σ_Y, MPa (kgf/mm^2), min. max.	379(38.7) -	517 (52.7) 724 (173.8)	655(66.8) 758(77.3)	655(66.8) 862(87.9)	724(73.8) 930(94.9)	834(85.0) 1030(105.0)	930(94.9) 1138(116.0)
Elongation, δ_5 %, min.	16	14	18	14	12	12	12
Reduction of area at fracture ψ, %, min.	50	50	60	50	45	45	45

1	2	3	4	5	6	7	8
Impact strength * KCV_{+21^0C}, kJ/m^2, (kgf m/cm^2), min.	690 (7)	690 (7)	-	690 (7)	690 (7)	690 (7)	690 (7)
Impact strength** KCV_{-60^0C}, kJ/m^2, (kgf m/cm^2), min.	-	-	longitid. speci-men 80 (8.2) transv. speci-men 40 (4.1)	-	-	-	-
Pipe body and upset sur-face hardness, HRC, max.	-	-	average 25.5 max. 27.0	-	-	-	-
Note: * - round-bottom notch impact strength KCU_{+21^0C} shall be determined according to TU 14-3-1849, TU 14-161-137, TU 14-161-138, TU 14-161-141, TU 1324-138-00147016.							

Table 3 – Mechanical properties of tool joints for drill pipe according to GOST 27834

Steel grade*	Ultimate tensile strength σ_U, MPa (kgf/mm^2), min.	Yield strength σ_Y, MPa (kgf/mm^2), min.	Elongation δ_5, %, min.	Reduction of area φ, %, min.	Brinell hardness *HB*, within	Impact strength J/cm^2 (kgf m/cm^2), min.	
						KCV	*KCU*
40ХМФА	981 (100)	832 (85)	13	50	300-355	58.9 (6)	88.3 (9)

* Tool joints may be made of other steel grades with the same or higher mechanical properties.

2.3 The weld after heat treatment shall comply with the following condition: the product of the yield strength and nominal weld cross-sectional area shall be equal to or exceed the product of the minimum admissible yield strength and nominal pipe cross-sectional area, as in the equation:

$$(\sigma_{Yw} \times A_w) \geq (\sigma_{Y\,min} \times A_p)$$

where:

σ_{Yw} – yield strength of weld;

A_w – nominal weld cross-sectional area;

$\sigma_{Y\,min}$ – minimum admissible yield strength of pipe body;

A_p – nominal pipe cross-sectional area.

Table 4 – Mechanical and impact properties of drill pipe body and tool joint according to API Spec 5DP with product specification level PSL1**

Grade	Yield strength, MPa		Ultimate tensile strength, MPa	Average absorbed energy, Charpy impact test, J /cm^2	Elongation, %,
	min.	min.	min.	min.	max.
Drill pipe body					
E	517	724	689	-	*
X	655	862	724	54	*
G	724	931	793	54	*
S	931	1138	1000	54	*
Tool joint					
	827	1138	965	54	13
Weld area					
	*	-	-	16	-
Notes: * - Calculated using the formula given in API 5DP; ** - Additional requirements for PSL 2 and PSL 3 are specified in API 5DP					

The tensile load corresponding to the yield strength of the weld shall be equal to or exceed the tensile load corresponding to the yield strength of the pipe body as in the equation:

$$(YS_w \times A_w) \geq (Y_{min} \times A_{dp})$$

where:

A_{dp} – nominal pipe body cross-sectional area determined using specified pipe body dimensions;

A_w – minimum weld cross-sectional area;

Y_{min} – minimum yield strength specified for drill pipe body;

YS_w – minimum yield strength specified for weld area (calculated by the Manufacturer).

The minimum weld cross-sectional area shall be determined from the following formula:

$$A_w = 0{,}7854 \times (D_{te\,min}^2 - d_{te\,max}^2)$$

where:

$d_{te\,max}$ – maximum admissible inside diameter specified by the drill pipe Manufacturer;

$D_{te\,min}$ – minimum admissible outside diameter specified by the drill pipe Manufacturer.

3 MARKING AND PACKING

The drill pipe is marked to provide data necessary to the Purchaser on each product and to provide for traceability.

The marking may be applied by die stamping, knurling or paint-stenciling, or using combined marking method. The product data shall be given in SI or US Customary System units according to the requirements specified on the order.

The content of marking applied by die stamping, knurling or paint-stenciling shall comply with the requirements of GOST R 50278, GOST 27834, TU, API Spec 5DP and API Spec 7-2 according to the requirements specified on the order.

3.1 Marking of Pipe and Tool Joints

For marking examples refer to Figures 1, 2, 3.

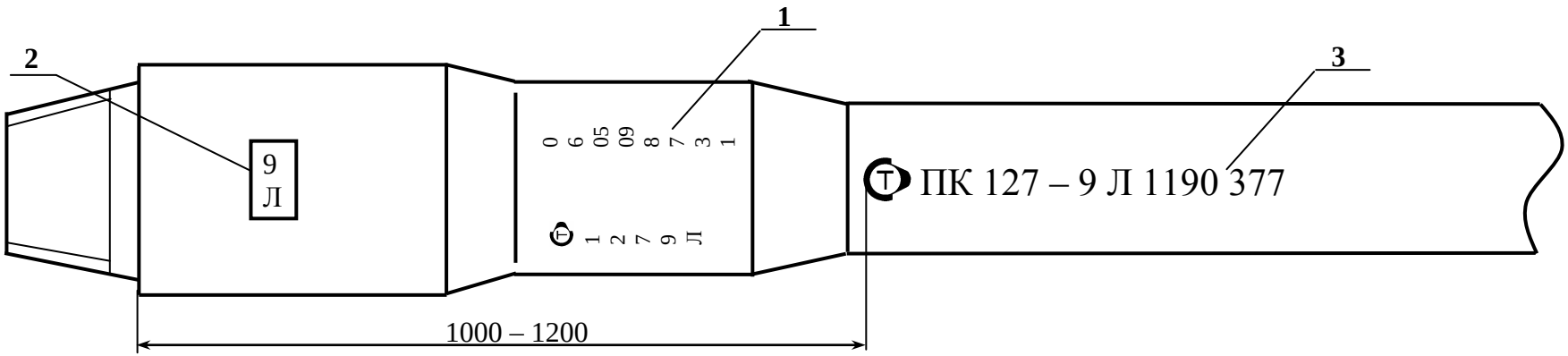
Figure 1 – example of marking for drill pipe according to GOST R 50278.

Figure 2 – example of marking for weld-on tool joints for drill pipe according to GOST 27834.

Figure 3 – example of marking for drill pipe according to API 5DP:

- Figure 3a – example of die-stamped marking for drill pipe according to API Spec 5DP;
- Figure 3b – example of paint-stenciled marking for drill pipe according API Spec 5DP with API monogram;
- Figure 3c – Figure 3b – example of paint-stenciled marking for drill pipe according API Spec 5DP without API monogram.

The pipe manufactured according to specifications shall be marked in compliance with the respective specification.



1 Die-stamped marking on pipe upset:

ⓉⓊ	- pipe manufacturer's trademark;
127	- specified pipe diameter, mm;
9	- specified wall thickness, mm;
Л	- grade;
06	- tool joint designation;
05 09	- date of manufacture (month and year);
8731	- pipe number

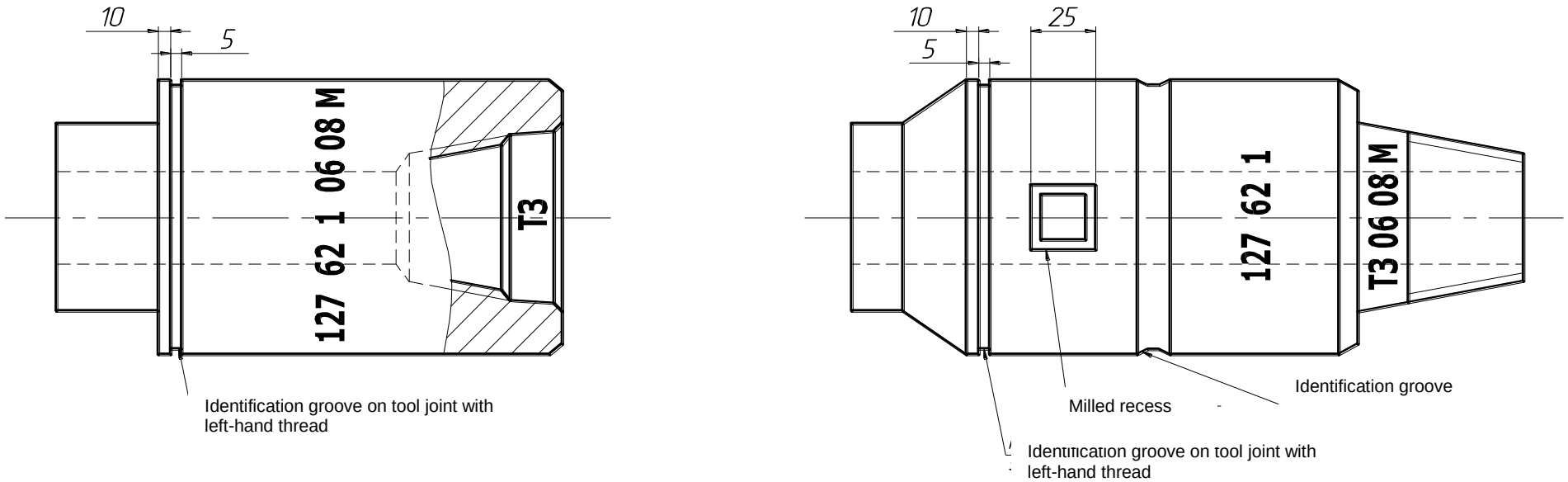
2 Die-stamped marking on milled identification recess

9	- specified wall thickness, mm;
Л	- grade

3 Paint-stenciled marking

ⓉⓊ	- pipe manufacturer's trademark;
ПК	- pipe type (drill pipe with internal-external upset);
127	- specified pipe diameter, mm;
9	- specified wall thickness, mm;
Л	- grade;
1190	- pipe length, cm;
377	- pipe mass, kg

Figure 1 – Marking on drill pipe ПК127х9, grade Л, according to GOST R 50278

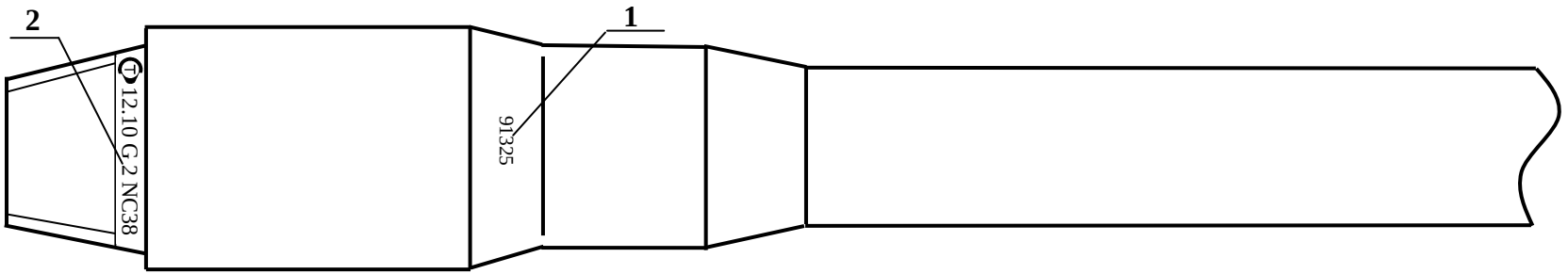


Notes

1. An identification groove is made on the pin and box in case of left-hand thread.
2. A milled recess is made on the outside surface of the tool-joint pin where the enterprise that welds the tool joint to the pipe body applies a marking with wall thickness and pipe grade identification.
3. An identification groove is made on the outside surface of tool-joint pins intended for pipe grade Л and higher.

Designation	Die-stamped marking content
127	specified outside diameter, mm
62	specified inside diameter, mm
1 or 2	alternative makes differing by shank outside diameter
T3	manufacturer's trademark
06 08	date of manufacture (month and year)
M	grade of pipe for which tool joint is intended

Figure 2 – Marking in weld-on tool joints according to GOST 27834



1. Die-stamped marking on pin taper:

91325 - pipe number

2. Die-stamped marking on tool-joint pin base:

- pipe manufacturer's trademark

12.10 - date of manufacture (month and year)

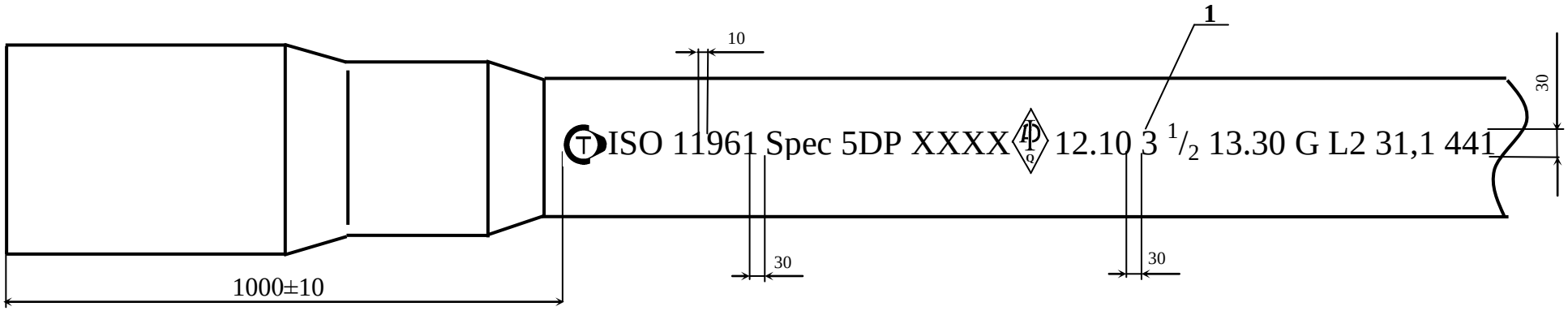
G - grade G-105

2 - pipe body mass code

NC 38 - tool joint designation

Note – font height for die-stamped marking is 4.8 mm

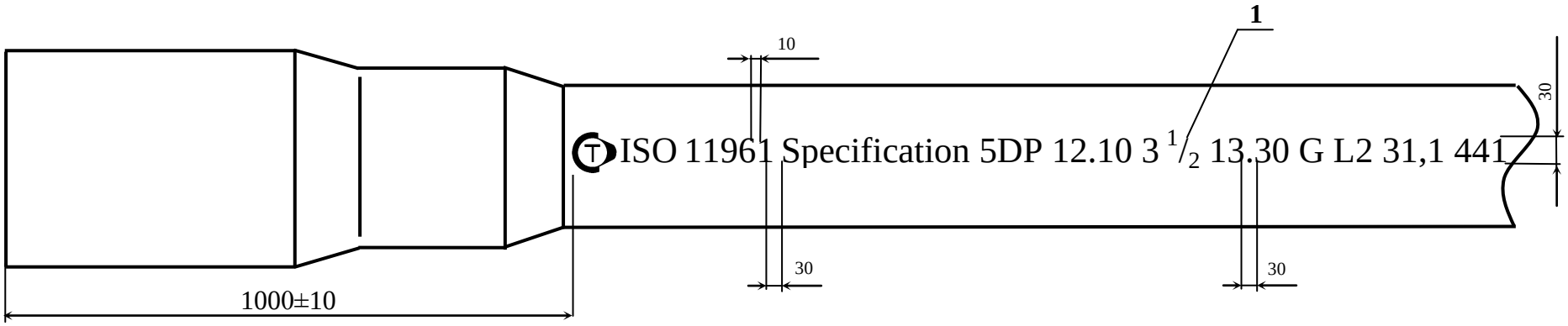
Figure 3a – Die-stamped marking for drill pipe according to API Spec 5DP, (dimensions in mm)



1. Paint-stenciled pipe marking on box side:

	- pipe manufacturer's trademark;
ISO 11961	- standard ISO 11961, if applicable;
Spec 5DP XXXX	- license number;
	- API monogram;
12.10	- date of pipe manufacture (month and year of welding);
$3\ ^{1}/_{2}$	- size designation (diameter in inches);
13.30	- mass designation (pounds per foot);
G	- grade G-105;
L2	- product specification level PSL2, if applicable;
31.1	- pipe length in feet and tenths of a foot;
441	- pipe weight in pounds

Figure 3b – Paint-stenciled marking on drill pipe according to API Spec 5DP with API monogram, (dimensions in mm)



1. Paint-stenciled pipe marking on box side:

ⓉⓉ	- pipe manufacturer's trademark;
ISO 11961	- standard ISO 11961, if applicable;
Specification 5DP	- specification API Spec 5DP;
12.10	- date of pipe manufacture (month and year of welding);
$3\ ^{1}/_{2}$	- size designation (diameter in inches);
13.30	- mass designation (pounds per foot);
G	- grade G-105;
L2	- product specification level PSL2, if applicable;
31.1	- pipe length in feet and tenths of a foot;
441	- pipe weight in pounds

Figure 3c – Paint-stenciled marking on drill pipe according to API Spec 5DP without API monogram, (dimensions in mm)

3.2 Packing of Pipe

3.2.1 General Requirements

3.2.1.1 The thread of welded-on tool joint pin and box and shoulders shall be protected against atmospheric corrosion and damages during all stages of handling, transportation and specified storage life at a temperature within the range from –46°C to +66°C with special metallic, combined (metal + polymer) or polymeric protectors.

The design of such protectors shall provide for easy unscrewing in field conditions.

An anticorrosive grease shall be applied over the threads and shoulders before protectors are screwed on.

In case of pipe manufactured according to API Spec 5DP, a thread compound, suitable for rotary shouldered connections, shall be applied; the anticorrosive grease may be applied only if specified on the order.

If the drill pipe Manufacturer has applied anticorrosive grease under the protectors, warning stickers shall be placed on the outer parts to inform the user that the anticorrosive grease shall be replaced prior to pipe utilization.

3.2.1.2 Pipe lengths of the same lot only shall be loaded on one car.

If a pipe lot or remaining pipe lengths do not match the load-carrying capacity of the car, pipe lengths of different lots may be loaded on one car provided they are separated.

3.2.1.3 One bundle shall contain pipe lengths of one lot only.

3.2.1.4 The mass of one pipe bundle shall not exceed 5 tons or, if required by the purchaser, 3 tons.

3.2.1.5 The load binders shall not be used as slings. The binders shall provide for multiple transloadings of the bundles and protect the pipe against accidental damages.

3.2.2 The following pipe packing patterns exist in TMK Company: *extra*, *economy*, *ordinary* and *simplified*.

3.2.2.1 The four patterns named above are based on the same bundle mass and the same number of pipe lengths similar in diameter and wall thickness, accordingly.

To fulfill the order in terms of total weight or length specified by the Purchaser, one or two bundles of the ordered lot may be formed lower in weight or number of pipe lengths then those provided for in these patterns.

3.2.2.2 The *extra* pattern provides for forming drill pipe bundles so as to reliably preclude any contact of pipe bodies, tool joint parts or upsets. To achieve this, the pipe lengths are laid on tray-type supports. At the option of the purchaser, the supports may be made external or internal, wooden or polymeric-metallic. The supports have separate trays

for each pipe length. The supports filled with pipe lengths are bundled using steel straps or studs.

The threads of drill pipe pins shall be safeguarded with metal protectors. The box end shall be also safeguarded with metal protectors. Polymeric protectors may be used that ensure pipe end protection with metal ring.

Each bundle is identified with three labels: one is attached to the aligned bundle end, two other are attached to the bundle side faces.

The labels contain the following information:

Manufacturer's name or trademark	
Consignee	
Destination	
Order No.	
Bundle No.	
Lot No.	
Heat No.	
GOST, TU No.	
Size	
Grade	
No. of pipe lengths, pcs	
Length, m	
Weight, t	
Address and contact phone	

3.2.2.3 The *economy* pattern provides for forming drill pipe bundles on external (or internal) wooden tray-type supports.

The drill pipe threads shall be safeguarded with metal protectors.

Each bundle is identified with two labels. One label is attached to the aligned bundle end, the other one is attached to the left bundle side face (left with respect to the aligned end).

3.2.2.4 The *ordinary* pattern of pipe packing provides for forming drill pipe bundles on external wooden tray-type supports.

At the request of the Purchaser, the ends of all the pipe lengths shall be safeguarded with polyethylene protectors. The ends of pipe exceeding 73 mm in diameter may be safeguarded with protectors made of thick polymeric material.

3.2.2.5 The *simplified* pattern of pipe packing provides for forming drill pipe bundles in compliance with the requirements of GOST 10692 and their shipping according to the loading patterns approved at the Manufacturer's.

The drill pipe ends and threads shall be protected in compliance with the requirements of current normative documents that govern the manufacture of the pipe shipped.

The plastic protectors to be installed on the pipe ends shall be selected with due consideration for pipe destination region, e.g. the protectors for pipe supplied to the regions with low average annual temperatures shall be made of cold-resistant plastic.

3.2.3 The pipe lengths shall be laid with the boxes facing the same side irrespective of the packing pattern used.

3.2.4 In case of *extra, economy* and *ordinary* patterns, the pipe ends on one bundle side shall be coplanar. The misalignment of pipe ends on the other bundle side shall not exceed 0.5 m.

3.2.5 Drill pipe lengths shall be bundled using external or internal tray-type supports and loaded in cars according to Table 5.

Table 5 – Specifications for car loading with drill pipe

Pipe Size	Bundle Width x Height, mm	Total Clearance Between Bundles, mm	Number of Pipe Lengths per Bundle, pcs	Bundle Weight, kg	Number of Bundles per Car, pcs	Tonnage per Car
60.3x7.1	540x648	119	30	3573	18	64.31
73.0x9.19(95)	510x510	270	25	4623	14	64.72
73.0x9.19 (104.8)	560x560	30		4835	13	62.86
88.9x9.35 (108)	572x458	532	20	4718	13	61.33
88.9x11.4 (127)	532x665	160		4980	13	64.74
114.3x8.56	580x580	499	15	4764	13	61.93
127.0x9.19 (161.9)	680x510	100	12	4400	14	61.60
127.0x12.7 (165.1)				4505	14	63.07

4 GOOD PRACTICE FOR PIPE OPERATION – REQUIREMENTS AND RECOMMENDATIONS

4.1 Drill-String Assembly Forming

4.1.1 According to the Petroleum and Natural Gas Industry Safety Code RD 08-624-03, the principal documents that govern drill-string assembly components and their quality are detailed designs developed and approved in compliance with the requirements of RD 08-624-03.

4.1.2 It is recommended to select drill-string assemblies based on the preliminary peer review of suitability of the pipe recommended in the design for the conditions of their future practical application.

4.1.3 The peer review of design drill-string assemblies and process-string assemblies (hangers) shall take the following into consideration:

- the strength design of drill strings shall consider well type and depth, well drilling and workover method, bore hole state, cover all expected deformation types and shall be performed according to the Drill-String Design Code requirements formulated by the Russian Engineering Supervision authorities (Rostekhnadzor);

- drill-string safety factor under static axial tensile load, torque and bending load shall be 1.5 at least for rotary drilling and 1.4 for downhole turbine motor drilling;

- drill-string safety factor (in terms of yield strength) under loads from spider and excessive external and internal pressure shall be 1.15 at least according to RD 08-624-03.

4.1.4 According to RD 08-624-03, the selection and design of drill-string assemblies for construction of horizontal wells shall be based on the following provisions:

- horizontal borehole section shall be constructed using the pipe of maximum possible diameter with minimum wall thickness;

- borehole deviation section and higher shall be constructed using thick-wall drill pipe;

- drill collars shall be located above the section of intensive borehole deviation;

- during well test with formation fluid output to the surface, the drill string shall be designed with due consideration for excessive external and internal pressure, which can arise in the course of the test;

- maximum design mass of drill string shall not exceed 0.6 of admissible hook load;

- all check and design strength calculations of drill strings shall be performed in compliance with the methods authorized by the Russian State Engineering Supervision authorities (Rostekhnadzor) (e.g. Drill-Strings for Oil and Gas Wells. Design Code. Moscow, 1997).

4.1.5 When forming drill-string assemblies for well construction, workover and rearrangement where H_2S can be present, the following shall be taken into consideration:

4.1.5.1 If H_2S in combination with other adverse factors (low pH of formation waters, presence of water in produced fluid, heavy-load situations, etc.) can impact drill strings and their components, hydrogen-sulfide corrosion may occur and, in particular, its most injurious form: sulfide stress cracking (SSC) that represents cracking until brittle failure (in presence of H_2S and water) while the material is subjected to tensile stresses, whose value is usually less than steel yield strength (σ_Y), but higher than threshold SSC stress (σ_{th}).

With all other conditions being equal, as the tensile stresses decrease the time to SSC increases, and when they are below the threshold value (σ_{th}) SSC does not occur.

If wrong pipe material and design are selected, their improper operation in H_2S-containing environments can prevent from the achievement of potential product advantages.

4.2 Pipe Pre-Operation Requirements

4.2.1 The pipe pre-operation activities include the following:

- making sets of new pipe supplies;
- die-stamp marking of pipe lengths included in a set;
- preparation of documentation required for pipe set (certificate, certificate-log).

4.2.2 The length of the set usually selected equal to the well depth plus 5-10% (pipe lengths for replenishment). The set is determined by the drilling enterprise based on the design structures and well depths, pipe strength properties and ease of their accounting. The sets shall not be separated until their full depreciation (wear-out).

4.2.3 Each set receives a serial number, all the pipe lengths in a set also receive their proper serial numbers. All the pipe lengths are marked with steel stamps (the height of rounded-edge letters and numerals shall not exceed 20 mm). The depth of the marking on pipe bodies shall not exceed 1 mm. The marking shall be applied to the pipe pin side on the pin shank at a distance of 20 to 25 mm from the tapered part.

4.2.4 The marking shall include serial number of set, pipe grade and wall thickness, last figure of the installation year, and serial pipe number in the set.

4.2.5 Drill-pipe marking example: 20 E10 9 42.

Where: 20 – serial number of set, E – pipe grade, 10 – wall thickness, 9 – year of installation, 42 – serial pipe number in the set.

4.2.6 All drill pipe lengths that passed the check inspection and found fit for service are included in the current drill pipe inventory of the Enterprise (pipe department).

4.2.7 To provide for normal operation conditions before the start of well drilling, an individual range of drill pipe lengths shall be gathered to form the single string; such a range shall include all the sets intended for the borehole concerned and required to ensure its failure-free making. The drill pipe range for main operations shall be assigned to the given borehole for the entire period of drilling. The entire drill string may be delivered to the drilling rig before the start of drilling or it may be delivered in drill pipe sets required for drilling certain borehole section. The pipe sets required for well repair are delivered to the drilling rig as may be necessary.

When a set of pipe lengths is sent to the drilling rig (well), their set class that denotes their technical condition or shall be shown in the set certificate.

The person directly responsible for pipe shipment at the enterprise shall verify that:

- no eventual unfitness record exists in the certificate (or on the pipe itself) for individual pipe lengths (to prevent their accidental delivery to the drilling rig);
- each pipe length belongs to the outbound set (certificate);
- protectors are installed and properly secured.

4.3 Performance and Turnover Log for Pipe Inventory

4.3.1 A log in duplicate shall be drawn up for each set of drill pipe. The pipe lengths that arrive at the tubular subdivision shall be prepared for operation in compliance with the order. A set shall include pipe lengths of the same size, grade and, if possible, the same Manufacturer. A report shall be drawn up for each set made, a list of pipe lengths that form the set shall be attached to such a report.

4.3.2 One copy of the log shall be retained in the tubular subdivision, the other copy, or an extract from it, shall be delivered to the drillmaster that uses that set of pipe lengths.

4.3.3 Do not separate the set. In exceptional cases, it may be supplemented with new pipe lengths of the same size and grade as the set pipe.

4.3.4 Pipe operation data, emergencies, maintenance and repairs shall be recorded in the log.

4.4 Round-Trip Operations with Drill Pipe

4.4.1 The personnel that performs drill-string assembly shall be trained in and qualified for this type of activities.

4.4.2 The tool joints shall be made up with torque measurement.

4.4.3 The tool joints shall be made up with the specified torque.

For the recommended make-up torques and limit axial tensile loads and torques for drill-pipe tool joints refer to Annex E.

The torque and load values were calculated so as to provide for the strength, tightness and maximum load-carrying capacity of tool joints.

4.4.4 Neither drill-pipe joints nor other drill-string assembly components shall be made up or broken out using rotary table motion.

4.4.5 During drill-string running, the power slips shall not be switched on until full string stop.

4.4.6 The power and automatic tongs may be only brought to the drill string after their landing on the slips or elevator.

4.4.7 If the drill string was seated in the course of running, the seating borehole section shall be flushed out and conditioned.

4.4.8 The wellhead shall be equipped with a device that prevents fall of foreign objects into the well when the string is out and during the round-trip operations.

4.4.9 During the round-trip operations on the drilling rig, it is prohibited to:

- push the pin down into the box in the course of pipe make-up;
- rotate the drill pipe (stand) after thread disengagement, or pull the pin out before full thread disengagement;
- abruptly brake the drill string when it is run down;
- use hoist hook with faulty spring for drill-string trip operations;
- use slips with dies that do not fit the pipe size;
- grip the pipe body with power tongs;
- apply tong jaws to the reinforced area of the tool-joint box;
- deliver drill pipe to the drilling rig and remove the pipe from it without protectors;
- permit any pipe-end impacts.

4.5 Recommendations for Selection of Thread Compounds

4.5.1 Before making up the tool joints, a thread compound that meets the performance objectives shall be applied as it substantially affects the wear resistance and tightness of threads. The thread compounds for tool joints shall resist high specific pressures, high temperature, seal thread clearances, be easily applicable, survive on thread surfaces for a long time, etc.

4.5.2 The performance parameters of compounds intended for drill pipe shall meet the following requirements:

- compatible frictional properties to allow making the joint up properly and uniformly;

- adequate greasy properties to prevent sticking or damaging of contact surfaces during making up and breaking out;

- adequate sealing properties for threaded joints that do not impair metal-to-metal interface depending on the performance requirements (not the threaded joint itself);

- physical and chemical stability both under service conditions and in storage;

- properties that allow using them efficiently on joint contact surfaces under anticipated operational and environmental conditions.

4.5.3 To assess thread-compound applicability, the Purchaser shall determine the conditions of its use and, in addition to the laboratory test results specified in the normative documents for the thread compound, take into consideration the field test results and experience.

4.5.4 For the recommended thread compounds and their scope of application refer to Table 6.

Table 6 – Scope of thread-compound application

Thread Compound	Scope of Application
VALMA-APINorm TU 0254-010-54044229-2009	For making up and tightening threaded joints of drill pipe, casing, and tubing, including those in cold-resistant and H_2S-resistant version. The service temperature ranges from minus 50°C to +200°C.
RUSMA-1 TU 0254-001-46977243-2002	For sealing and tightening threaded joints in wells at oil, gas and gas-condensate fields operated under a pressure up to 70 MPa and at temperatures from minus 50°C to +200°C.
RUS-OLYMP TU 0254-009-540044229-05	For tool joints of imported and domestic drill pipe. The service temperature ranges from minus 50°C to +200°C.
RUS-PREMIUM TU 0254-008-540044229-05	For making up threaded joints of tubing and casing with metal-to-metal sealed threaded joints, including VAM-type gastight joints and VAGT. SECFR. SPMS2 joints harmonized with the former, when using these tubing and casing for sour service. This one may be also used as storage compound.

4.5.5 The minimum amount of the compound shall be proportioned between the pin and box as follows: 2/3 to the box, 1/3 to the pin. In exceptional cases, if the compound is applied to one joint component only, it should be preferably applied to the box.

4.5.6 Thread compound of the same type only and manufactured in compliance with one specification (TU) shall be stored and applied in the point of use.

4.5.7 The service container with compound shall be covered to prevent penetration of dirt or foreign objects in the compound.

4.5.8 The compounds shall be thoroughly mixed prior to application. When using any compounds, avoid their contact with skin or swallowing them.

4.5.9 The Purchaser is responsible for fulfillment of any local environmental regulations and compound selection, use and disposal.

4.5.10 If the drill pipe Manufacturer has applied anticorrosive grease under the protectors and placed warning stickers on outer parts to inform about this, the anticorrosive grease shall be fully removed prior to making the joints up, and thread compound shall be applied to the threads and shoulders. The thread compound shall be applied to clean and dry surfaces of pin and box threads and shoulders.

4.5.11 Use of machine oil or diesel oil instead of greases or making threads up without compounds are prohibited.

4.6 Drill Pipe Operation

4.6.1 To extend pipe service life and prevent thread sticking, the threads of new pipe shall be run in by 3 – 5 makes-and-breakes at a low speed of 10 – 15 rpm, remove old thread compound and apply fresh thread compound after each breakout.

4.6.2 To provide for uniform tool-joint thread wear, replace the working joints with inactive ones each ten-twenty free falls (working joint is that used to join the drill-pipe stand to the drill string).

4.6.3 The tensile loads, e.g. in case of drill string sticking, shall be applied with due consideration for pipe grade and class. The maximum admissible tensile loads shall not exceed 80% of pipe material yield strength.

4.6.4 When drilling H_2S-containing formations, monitor hydrogen sulfide and other sulfides in the drilling mud. If detected, treat the drilling mud with a neutralizing agent additionally.

The drill pipe that had contact with hydrogen sulfide shall be subjected to NDT and hydrostatic test after their breakout and prior to further use.

4.7 Classification of Pipe Depending on Their Wear-and-Tear Parameters

4.7.1 The pipe shall be discarded in case of wear and tear, fatigue wear or various defects if they exceed the values admissible for the 3rd class.

4.7.2 The tool-joint threads shall be rejected, if one or more threads are damaged, or tears and spallings that can result in thread sticking are detected. The tool joints shall be rejected, if tears and spallings on pin shoulders and box faces exceed 1/3 of shoulder or face width, and their extent exceeds 1/8 of the circumference.

4.7.3 The drill pipe shall be discarded or downgraded based on the visual inspection results, instrumental measurements and NDT data, an appropriate report shall be issued.

4.7.4 The abrasive wear resulting from drill string friction when in contact with rocks affects both the tool joints and the drill pipe body. Depending on the abrasive wear the pipe is classified into three classes.

The 1st class includes pipe and tool joints whose geometry complies with nominal requirements of the current normative documents.

The 2nd and 3rd pipe-body wear classes include used pipe whose defects do not exceed the values shown in Table 7. If the extent of wear or defect size exceed the value specified for the 3rd class, the pipe shall be rejected and removed from service. The information about pipe downgrading shall be shown in the set certificate.

4.7.5 The specifications for pipe of different classes are determined by analogy with the specification of the new pipe (1st class) with due consideration for the specified wall thicknesses: 80% of the nominal value for the 2nd class and 62.5% for the 3rd class.

For classification of tool joints according to their side surface wear refer to Table 8.

Table 7 – Classification of Worn Drill Pipe

Defect	Pipe Class	
	II	III
1	2	3
Uniform wear of outside pipe surface: Remaining wall thickness, %, min.	80	62.5
Off-center wear of outside pipe surface: Remaining wall thickness, %, min.	65	55
Dents, % of outside diameter, max.	3	5
Collapse, % of outside diameter, max.	3	5
Necking, % of outside diameter, max.	3	5
Residual diameter reduction: Outside diameter reduction, %, max.	3	5
Residual expansion: Outside diameter enlargement, %, max.	3	5
Longitudinal notches-nicks: Remaining wall thickness, %, min.	80	62.5
Transverse notches: Remaining wall thickness, %, min. Notch length, % of circumference, max.	90 10	80 10
Wall thickness under the deepest corrosion spot, % of nominal one, min.	80	55

Table 8 – Classification of Worn Tool Joints

in millimeters

Tool Joint Size	Tool-Joint Outside Diameter			
	uniform wear for classes		non-uniform wear for classes	
	II	III	II	III
3П-86	83.4	81.7	84.7	82.6
3П-105	101.9	99.7	103.4	100.8
3П-111	107.7	105.5	109.3	106.6
3П-121	117.4	115.0	119.2	116.2
3П-127	123.2	120.7	125.1	121.9
3П-133	129.0	126.44	131.0	127.7
3П-152	147.4	144.4	149.7	145.9

Table 8 (continued

Tool Joint Size	Tool-Joint Outside Diameter

	uniform wear for classes		non-uniform wear for classes	
	II	III	II	III
3П-159	154.2	151.0	156.6	152.6
3П-162	157.1	153.9	159.6	155.5
3П-165	160.0	156.8	162.5	158.4
3П-168	163.0	159.6	165.5	161.3
3П-178	172.7	169.1	175.3	170.9
3П-184	178.5	174.8	180.3	175.6
3П-190	184.3	180.5	187.1	182.4

4.7.6 The degree of pin and box thread wear shall be determined from the criterion *H*. The criterion *H* is the distance between the shoulder face of the part under examination and that of the gage (tool-joint counterpart) or pin and box pair determined as follows: the gage (or the counterpart) is installed in the thread and then turned backwards (breakout direction) within one thread turn until threads are disengaged over their crests and the gage moves into the part, as if jumping, by an amount comparable to the thread pitch, refer to Table 9.

4.7.7 If necessary, the total thread wear degree of both tool-joint parts may be determined in the same way (using criterion *H*) before making them up on the drilling floor. In this case, the pin is installed in the box, then the upper tool-joint part is turned backwards (breakout direction) with respect to the lower part (e.g. applying power tongs until the pin axially moves into the box, as if jumping) (Table 9).

Table 9 – Classification of Worn Tool Joints Using Criterion *H*

in millimeters

Tool-Joint Thread Designation	Number of Threads per 25.4 mm	Taper	Thread Profile Form	Criterion *H* for gage min.			Criterion *H* for pin-box pair, min.		
				Classes					
				I	II	III	I	II	III
3-66	5	1:4	I	18	15	12	18	12.5	9
3-73	4	1:6	IV	28	23	20	28	19.5	14
3-76	5	1:4	I	18	15	12	18	12.5	9
3-86	4	1:6	IV	28	23	20	28	19.5	14
3-88	5	1:4	I	18	15	12	18	12.5	9
3-101	5	1:4	I	18	15	12	18	12.5	9
3-102	4	1:6	IV	28	23	20	28	19.5	14
3-108	4	1:6	IV	28	23	20	28	19.5	14
3-117	5	1:4	I	18	15	12	18	12.5	9
3-121	5	1:4	I	18	15	12	18	12.5	9
3-122	4	1:6	IV	28	23	20	28	19.5	14
3-133	4	1:6	IV	28	23	20	28	19.5	14
3-140	4	1:4	I	18	15	12	18	12.9	9
3-147	4	1:6	III	34.5	29	25	34.5	24	18
3-152	4	1:6	III	34.5	29	25	34.5	24	18
3-161	4	1:6	III	34.5	29	25	34.5	24	18

4.7.8 The worn steel drill pipe manufactured according to API shall be classified similarly to the pipe manufactured according to GOST.

4.8 Supervision of Drill Pipe Performance in Operation

4.8.1. The pipe shall be subjected to NDT and hydrostatic test, tool-joint thread wear shall be determined as the distance measured between pin and box shoulder faces at the moment of makeup start, the outside diameter of tool joints and pipe shall be measured, and pipe collapse in the place of contact with power slips shall be measured in compliance with the Geotechnical Job Order and Preventive Maintenance Schedule.

The monitoring of pipe condition in the course of operation on the drilling rig (well) usually is performed by the drilling crewmen (shift team) involved in round-trip activities.

4.8.2 The full-scale inspection of technical condition shall be performed by qualified experts in stable conditions (tubular shops, sites) and using instruments approved as specified.

The scope of inspection, its frequency, list of parameters subject to inspection at all stages shall be determined by the technical services of the enterprise depending on the inspection objectives.

4.8.3 The technical condition of pipe shall be assessed by visual inspection, measurements, ultrasonic, magnetic or fluoroscopic flaw detection methods or any other methods depending the inspection objective and object.

4.8.4 The following pipe loads shall be determined during its operation with an error not exceeding 5%:

- thread tightening torque;
- axial force;
- torque;
- pipe deviation (hole deviation);
- internal and external fluid pressure;
- number of revolutions (cycles), makeups, landings, seizures, round trips and other variable loads, and:
- fluid temperature;
- specific fluid gravity;
- corrosive agents in fluid.

The above loads shall not exceed (taking into consideration combined stresses) the limit loads (Annex A) with due account for safety factor.

To assess the effective stress on steel drill pipe under bending, torsional and tensile loads, load application areas shall be determined from the charts in Annex D.

4.8.5 The Manufacturer shall be informed of all failures, emergencies, and rejections attributed to pipe quality.

4.9 Basic Recommendations for Prevention of Emergency Pipe-String Failure

4.9.1 Before starting well construction, workover and reconfiguration, the degree of drill-string failure risks shall be assessed, specifically, those attributable to special operation conditions (low-temperature service, operation in corrosive environments, etc.) and, if necessary, risk mitigation measures shall be designed.

4.9.2 The preventive measures required to mitigate the failure risks identified for drill strings used in well construction and workover shall be designed with strict observance of the provisions specified in the Section 4 *Good Practice for Pipe Operation – Requirements and Recommendations* of this Manual.

4.9.3 To reduce the rate of emergencies in the course of drilling operations the following is required:

- good knowledge of geological factor governing well construction, borehole sections that can result in eventual troubles;
- strict fulfillment of the requirements specified in the detail design, current regulations, safe practices in petroleum and gas industries, drilling practices and techniques, drilling program (all these documents shall be available at the rig);
- periodic check calculations of drill strings using the actual well parameters and implementation of any necessary corrections;
- monitoring of drilling mud quality, borehole and drill string condition, performance of equipment and tools;
- knowledge and fulfillment of service instructions for equipment and pipe;
- monitoring of existing loads and, especially, the torque;
- makeup using tongs equipped with torque gage;
- complete and timely fulfillment of the actions specified in the maintenance schedule to provide for trouble-free drilling operations;
- fulfillment of the requirements specified in Section 4 *Good Practice for Pipe Operation – Requirements and Recommendations* of this Manual.

5 PIPE TRANSPORTATION AND STORAGE

The fundamental requirement for pipe transportation and storage is prevention of any pipe damage, including those that can arise during storage.

5.1 Pipe Transportation

The pipe shall be transported by any kind of transport specially equipped for this purpose and having appropriate load-carrying capacity.

The vehicles used for pipe transportation (including motor transport) from storage yards (warehouses) shall have specially designed handling equipment. The vehicle surfaces that contact with the pipe shall be rubber-coated or wooden to prevent pipe damage. The overhang of pipe ends shall not exceed 1 m.

The pipe shall be never dragged, towed or thrown, the pipe shall never strike against each other or metal objects.

At sites, the pipe shall be transported with swing cranes, auxiliary winches or hoists.

Prior to transportation, make sure that pipe threads are covered with anticorrosive grease and protectors.

Avoid pipe striking against each other or against metal parts of vehicles during handling, use special beams or straps. For strapping pattern refer to Figure 2.

After loading on the vehicle, securely fasten the pipe, raise side posts and additionally fix them.

Prior to unloading (before opening), check pipe fasteners. If the pipe is unloaded manually, roll them down using skids, prevent their rolling away or striking against each other. For patterns of pipe stacking on special transport means refer to Figure 3.

5.2. Pipe Storage

Never put the pipe on ground or concrete floor directly.

The pipe shall be stacked and stored separately, sorted out by size. One rack shall contain the pipe of the same parameters: label, specified diameter, wall thickness, grade, class, type and thread hand.

Requirements for pipe stacking and storage:

- the supporting rack surface shall be horizontal to prevent pipe rolling out, its elevation shall be 0.3 m at least above ground;

- the height of pipe stack on a rack shall not exceed 2.5 m and the pipe shall be secured with posts to prevent rolling out;

- when the pipe is laid in several rows, place 3 wooden blocks (35-40 mm thick) between each row so that the tool-joint elements do not touch each other;

- the blocks shall be placed square to pipe axes over rack supports to prevent their sagging, they shall be fitted with stop strips at the ends;

- pipe shall be laid with boxes in the same direction;

- the pipe rejected and requiring repair shall be laid on a separate rack and clearly identified;

- the weight of pipe shall not exceed rack load capacity;

- each rack shall be identified with a data plate that contains main pipe specifications.

For recommended pipe stacking patterns refer to Figures 3, 4 and 5.

Never store acids, alkalis and other chemically active substances that can provoke corrosion of pipe, tool joints and subs near the racks.

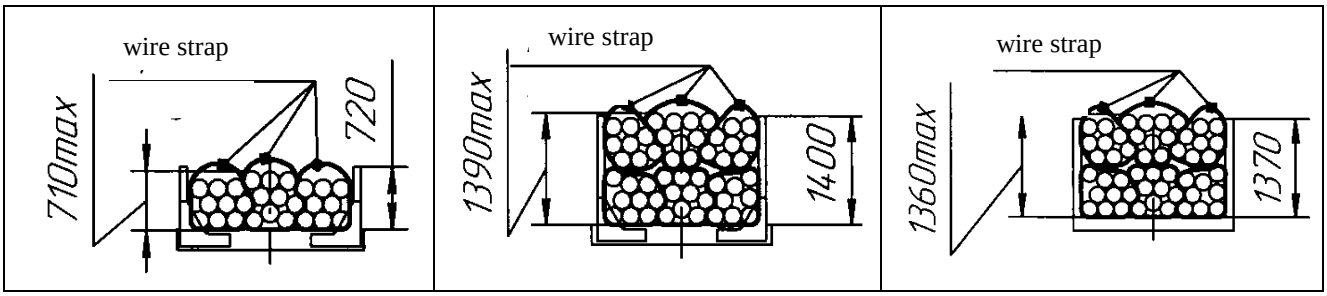


Figure 2 – Strapping Pattern for Handling Operations

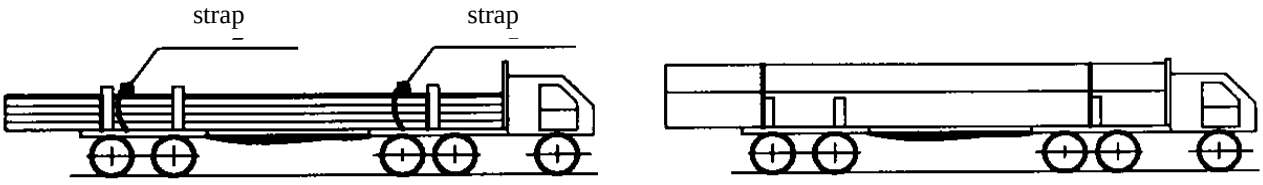


Figure 3 – Patterns of Pipe Stacking on Special Transport Means

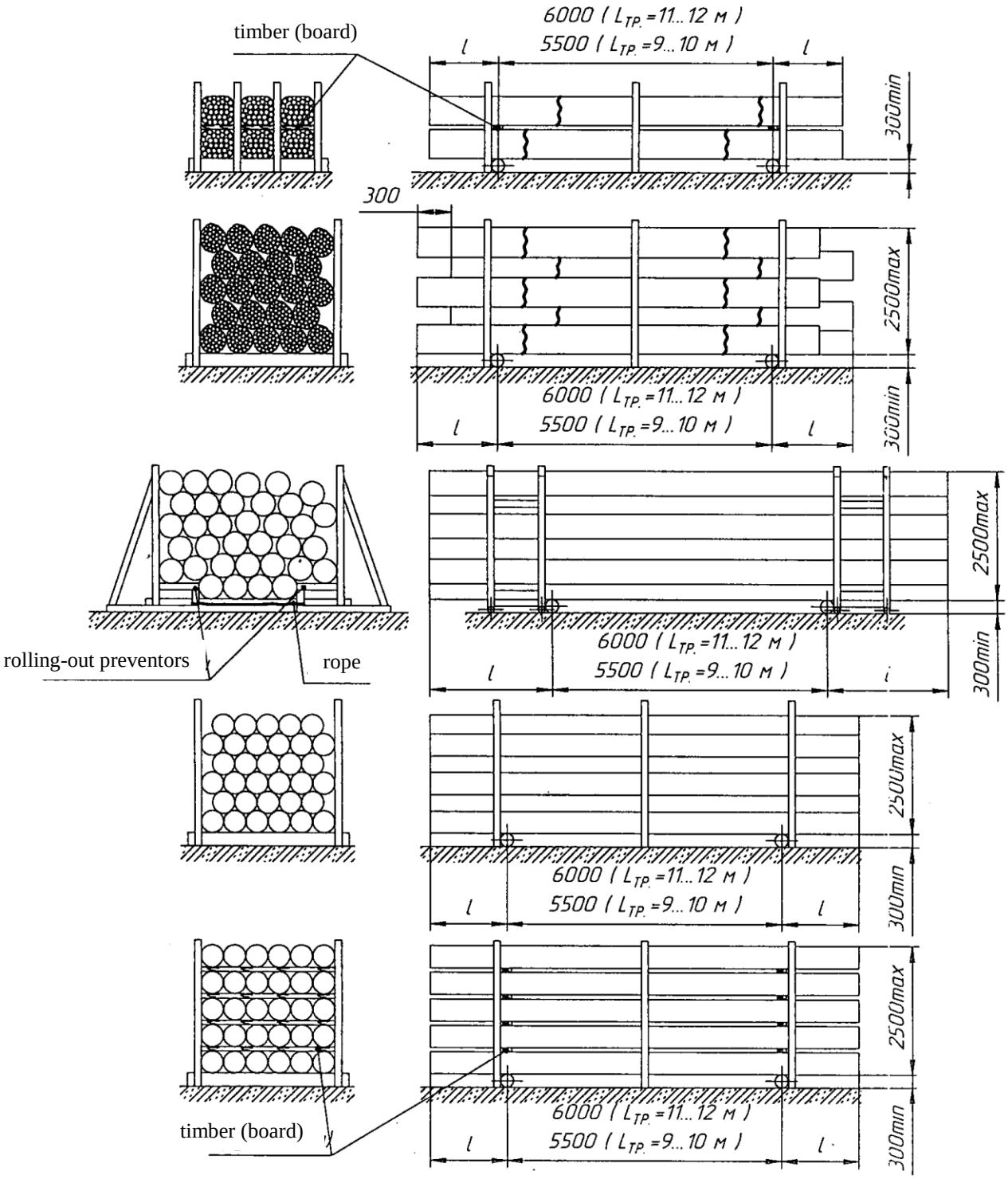


Figure 4 – Pipe Stacking Patterns

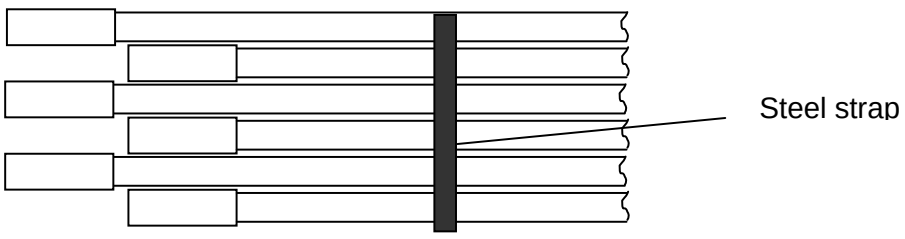


Figure 5 – Pipe Bundle Stacking Pattern

6 SAFETY REQUIREMENTS

To provide for safe pipe operation, the following is required:

Strict fulfillment of the requirements specified in the Manufacturer's Operation Manual supplied with the product, other Manufacturer's recommendations, and those specified in comprehensive corporate pipe service regulations approved in compliance with the procedures existing at drilling enterprises provided they do not disagree with the provisions of the Manufacturer's Operation Manual and RD 08-624-03.

7 MANUFACTURER'S WARRANTY

The Manufacturer guarantees compliance of the pipe and tool joints with the requirements set forth in the normative documentation for the period specified in the contract (supply agreement) provided the user observes pipe operation and storage procedures.

Annex A Sizes and Specifications of Drill Pipe Manufactured According to API Spec 5DP

Table A.1 – Sizes and Specifications of Drill Pipe Manufactured According to API Spec 5DP

Pipe Body										Tool Joint							Assembly	
Specified Size inch mm	Specified Weight lb/ft kg/m	Wall Thickness inch mm	Inside Diameter inch mm	Grade	Upset	Tensile Load lb kN	Torque lb·ft Nm	Internal pressure Psi bar	Collapse Load Psi bar	Joint	Outside Diameter inch mm	Inside Diameter inch mm	Length of Tongs Area on Pin inch mm	Length of Tongs Area on Box inch mm	Tensile Load lb kN	Torque lb·ft Nm	Approximate Mass lb/ft kg/m	Makeup Torque ft·lb Nm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2 3/8 60.3	6.65 9.34	0.280 7.11	1.815 46.13	E	EU	138214 615	6250 8474	15474 1067	15599 1075	NC26	3 3/8 85.725	1 3/4 44.45	7 177.8	8 203.2	313681 1395	6875 9321	6.99 10.41	4125 5593
2 3/8 60.3	6.65 9.34	0.280 7.11	1.815 46.13	X	EU	175072 779	7917 10734	19600 1351	19759 1362	NC26	3 3/8 85.725	1 3/4 44.45	7 177.8	8 203.2	313681 1395	6875 9321	7.11 10.59	4125 5593
2 3/8 60.3	6.65 9.34	0.280 7.11	1.815 46.13	G	EU	193500 861	8751 11864	21663 1493	21839 1505	NC26	3 3/8 85.725	1 ¾ 45.45	7 177.8	8 203.2	313681 1395	6875 9321	7.11 10.59	4125 5593
2 7/8 73.0	10.4 15.49	0.362 9.19	2.151 54.64	E	EU	214344 953	11554 15665	16526 1139	16509 1138	NC31	4 1/8 104.8	2 1/8 53.98	7 177.8	9 228.6	447130 1989	11790 15985	10.87 16.19	7122 9656
2 7/8 73.0	10.4 15.49	0.362 9.19	2.151 54.64	X	EU	271503 1208	14635 19842	20933 1443	20911 1441	NC31	4 1/8 104.8	2 50.80	7 177.8	9 228.6	495726 2205	13158 17839	11.09 16.52	7918 10735
2 7/8 73.0	10.4 15.49	0.362 9.19	2.151 54.64	G	EU	300082 1335	16176 21932	23137 1595	23112 1593	NC31	4 1/8 104.8	2 50.80	7 177.8	9 228.6	495726 2205	13158 17839	11.09 16.52	7918 10735
2 7/8 73.0	10.4 15.49	0.362 9.19	2.151 54.64	S	EU	385820 1716	20798 28198	29747 2051	29716 2048	NC31	4 3/8 111.1	1 5/8 41.28	7 177.8	9 228.6	623844 2775	16809 22790	11.55 17.20	10167 13785
3 1/2 88.9	9.50 14.1	0.254 6.45	2.92 76.00	E	EU	194264 864	14146 19120	9525 656.7	10001 689.5	NC38	4.750 120.65	2 11/16 68.26	8 203.2	10 1/2 266.7	587308 2613	18071 24500	13.93 20.75	10864 14730
3 1/2 88.9	13.3 19.81	0.368 9.35	2.764 70.20	E	EU	271569 1208	18551 25152	13800 951	14113 973	NC38	4 3/4 120.7	2 11/16 68.26	8 203.2	10 1/2 266.7	587308 2613	18071 24500	13.93 20.75	10864 14730
3 1/2 88.9	13.3 19.81	0.368 9.35	2.764 70.20	X	EU	343988 1530	23498 31860	17480 1205	17877 1232	NC38	5 127.0	2 9/16 65.09	8 203.2	10 1/2 266.7	649158 2888	20095 27245	14.62 21.78	12196 16536
3 1/2 88.9	13.3 19.81	0.368 9.35	2.764 70.20	G	EU	380197 1691	25972 35213	19320 13321	19758 1362	NC38	5 127.0	2 7/16 61.91	8 203.2	10 1/2 266.7	708063 3150	22035 29875	14.71 21.91	13328 18070
3 1/2 88.9	13.3 19.81	0.368 9.35	2.764 70.20	S	EU	488825 2174	33392 45273	24840 1712	25404 1751	NC38	5 127.0	2 1/8 53.98	8 203.2	10 1/2 266.7	842440 3748	26503 35933	14.92 22.22	15909 21570
3 1/2 88.9	15.5 23.09	0.449 11.4	2.602 66.10	E	EU	322775 1436	21086 28589	16838 1160	16774 1156	NC38	5 127.0	2 9/16 65.09	8 203.2	10 1/2 266.7	649158 2888	20095 27245	16.54 24.64	12196 16536
3 1/2 88.9 1	15.5 23.09	0.449 11.4	2.602 66.10	X	EU	408848 1819	26708 36211	21328 1470	21247 1465	NC38	5 127.0	2 7/16 61.91	8 203.2	10 1/2 266.7	708063 3150	22035 29875	16.82 25.05	13328 18070

Table A.1 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
3 $^{1}/_{2}$ 88.9	15.5 23.09	0.449 11.4	2.602 66.10	G	EU	451885 2010	29520 40023	23573 1625	23484 1619	NC38	5 127.0	2 $^{1}/_{8}$ 53.98	8 203.2	10 $^{1}/_{2}$ 266.7	842440 3748	26503 35933	17.03 25.37	15909 21570
3 $^{1}/_{2}$ 88.9	15.5 23.09	0.449 11.4	2.602 66.10	S	EU	580995 2585	37954 51459	30308 2090	30194 2081	NC40	5 $^{1}/_{2}$ 139.7	2 $^{1}/_{4}$ 57.15	7 177.8	10 254.0	979996 4360	32693 44325	17.57 26.17	19766 26799
4 101.6	14.00 20.85	0.330 8.38	3.34 84.84	E	EU	285359 1269	23288 31580	10828 747	11354 783	NC46	6.00 152.4	3.250 82.6	7 177.8	10 254.0	893933 3978	33595 45521	15.83 23.59	16797 22760
4 101.6	14.00 20.85	0.330 8.38	3.34 84.84	X	EU	361454 1607	29498 39990	13716 946	14382 992	NC46	6.00 152.4	3.250 82.6	7 177.8	10 254.0	893933 3978	33595 45521	15.83 23.59	16797 22760
4 101.6	14.00 20.85	0.330 8.38	3.34 84.84	G	EU	399502 1777	32603 44204	15159 1045	15896 1096	NC46	6.00 152.4	3.250 82.6	7 177.8	10 254.0	893933 3978	33595 45521	15.83 23.59	16797 22760
4 101.6	14.00 20.85	0.330 8.38	3.34 84.84	S	EU	513646 2282	41918 56810	19491 1344	20141 1389	NC46	6.00 152.4	3.250 76.2	7 177.8	10 254.0	1040000 4628	39193 53107	16.90 23.76	18725 25841
4 $^{1}/_{2}$ 114.3	13.75 20.43	0.271 6.88	3.958 100.54	E	EU	270034 1200	25907 35087	7904 545	7173 495	NC50	6.625 168.3	3.875 95.3	7 177.8	10 254.0	931685 4146	37676 51005	15.9 23.65	16615 25502
4 $^{1}/_{2}$ 114.3	16.60 24.73	0.337 8.56	3.826 97.18	E	EU	330558 1470	30807 41774	9829 678	10392 717	NC50	6.625 168.3	3.750 95.3	7 177.8	10 254.0	931685 4146	37676 51005	18.46 27.51	18420 25502
4 $^{1}/_{2}$ 114.3	16.60 24.73	0.337 8.56	3.826 97.18	X	EU	418707 1863	39022 52914	12450 858	12765 880	NC50	6.625 168.3	3.750 95.3	7 177.8	10 254.0	931685 4146	37676 51005	18.84 28.07	20523 25502
4 $^{1}/_{2}$ 114.3	16.60 24.73	0.337 8.56	3.826 97.18	G	EU	462781 2059	43130 58484	13761 949	13825 953	NC50	6.625 168.3	3.750 95.3	7 177.8	10 254.0	931685 4146	37676 51005	18.84 28.07	20523 25502
4 $^{1}/_{2}$ 114.3	16.60 24.73	0.337 8.56	3.826 97.18	S	EU	595004 2645	55453 75194	17693 1220	16773 1156	NC50	6.625 168.3	3.500 88.9	7 177.8	10 254.0	1101123 4900	44610 60447	19.11 28.47	22258 30223
4 $^{1}/_{2}$ 114.3	20.00 29.79	0.430 10.92	3.64 92.46	E	EU	412358 1834	36901 50038	12542 865	12964 894	NC50	6.625 168.3	3.625 92.1	7 177.8	10 254.0	1011685 4502	35541 54334	22.10 32.93	21437 27167
4 $^{1}/_{2}$ 114.3	20.00 29.79	0.430 10.92	3.64 92.46	X	EU	522320 2322	46741 63381	15886 1095	16424 1132	NC50	6.625 168.3	3.500 88.9	7 177.8	10 254.0	1101123 4900	44610 60447	22.57 33.63	22496 30223
4 $^{1}/_{2}$ 114.3	20.00 29.79	0.430 10.92	3.64 92.46	G	EU	577301 2568	51661 70052	17558 1211	18149 1251	NC50	6.625 168.3	3.500 88.9	7 177.8	10 254.0	1101123 4900	44610 60447	22.57 33.63	22496 30223
4 $^{1}/_{2}$ 114.3	20.00 29.79	0.430 10.92	3.64 92.46	S	EU	742244 3302	66421 90067	22575 1556	23335 1609	NC50	6.625 168.3	3.000 76.2	7 177.8	10 254.0	1404944 6252	57747 78248	23.05 34.34	26056 39124
4 101.6	14.0 20.85	0.330 8.38	3.340 84.84	E	IU	258359 1269	23288 31574	10828 746	11354 782	NC40	5 $^{1}/_{4}$ 133.4	2 $^{13}/_{16}$ 71.44	7 177.8	10 254.0	711611 3166	23279 31562	15.04 22.40	17092 19106
4 101.6	14.0 20.85	0.330 8.38	3.340 84.84	X	IU	361454 1608	29498 39994	13716 945	14382 992	NC40	5 $^{1}/_{4}$ 133.4	2 $^{11}/_{16}$ 68.26	7 177.8	10 254.0	776406 3454	25531 34615	15.34 22.85	15404 20885
4 101.6	14.0 20.85	0.330 8.38	3.340 84.84	G	IU	399502 1777	32603 44204	15159 1045	15896 1096	NC40	5 $^{1}/_{2}$ 139.7	2 $^{7}/_{16}$ 61.91	7 177.8	10 254.0	897161 3991	29764 40354	15.91 23.70	18068 24497
4 $^{1}/_{2}$ 114.3	16.6 24.73	0.337 8.56	3.826 97.18	E	IEU	330558 1470	30807 41774	9829 678	10392 717	NC46	6.25 158.8	3.25 82.55	7 177.8	10 254.0	901164 4009	33228 45057	18.37 27.35	20396 27657
4 $^{1}/_{2}$ 114.3	16.6 24.73	0.337 8.56	3.826 97.18	X	IEU	418707 1863	39022 52914	12450 859	12765 880	NC46	6.25 158.8	3 76.20	7 177.8	10 254.0	1048426 4664	38998 52881	18.79 27.98	20396 27657
4 $^{1}/_{2}$ 114.3	16.6 24.73	0.337 8.56	3.826 97.18	G	IEU	462781 2059	43130 58484	13761 949	13825 953	NC46	6.25 158.8	3 76.20	7 177.8	10 254.0	1048426 4664	38998 52881	18.79 27.98	23795 32266
4 $^{1}/_{2}$ 114.3	16.6 24.73	0.337 8.56	3.826 97.18	S	IEU	595004 2647	55453 75194	17693 1220	16773 1157	NC46	6.25 158.8	2.75 69.85	7 177.8	10 254.0	1183908 5266	44359 60151	19 28.29	26923 36508
4 $^{1}/_{2}$ 114.3	20.00 29.79	0.430 10.92	3.640 92.46	E	IEU	412358 1834	36901 50038	12542 865	12964 894	NC46	6.25 158.8	3 76.20	7 177.8	10 254.0	1048426 4664	38998 52881	22.09 32.89	23795 32266

Table A.1 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
4 $1\frac{1}{2}$ 114.3	20.00 29.79	0.430 10.92	3.640 92.46	X	IEU	522320 2323	46741 63381	15886 1096	16421 1132	NC46	6.25 158.8	2.75 69.85	7 177.8	10 254.0	1183908 5266	44359 60151	22.67 33.76	26923 36508
4 $1\frac{1}{2}$ 114.3	20.00 29.79	0.430 10.92	3.640 92.46	G	IEU	577301 2568	51661 70052	17558 1211	18149 1252	NC46	6.25 158.8	2.5 63.50	7 177.8	10 254.0	1307608 5817	49297 66847	22.86 34.03	29778 40379
4 $1\frac{1}{2}$ 114.3	20.00 29.79	0.430 10.92	3.640 92.46	S	IEU	742244 3302	66421 90067	22575 1557	23335 1609	NC46	6.25 158.8	2.25 57.15	7 177.8	10 254.0	1419527 6315	53800 79953	23.03 34.29	29502 39976
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	E	IEU	395595 1760	41167 55822	9503 655	9962 687	NC50	6.625 168.28	3.75 95.25	7 177.8	10 254.0	939095 4177	37269 50537	20.85 31.05	22836 30966
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	E	IEU	395595 1760	41167 55822	9503 655	9962 687	$5\frac{1}{2}$FH	7 177.8	3.75 95.25	8 203.2	10 254.0	1448407 6443	62903 85296	22.28 33.17	31474 42648
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	X	IEU	501087 2229	52144 70707	12037 830	12026 829	NC50	6.625 168.28	3.5 88.90	7 177.8	10 254.0	1109920 4937	44456 60282	21.45 31.94	27076 36715
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	X	IEU	501087 2229	52144 70707	12037 830	12026 829	$5\frac{1}{2}$FN	7 177.8	3.75 95.25	8 203.2	10 254.0	1448407 6443	62903 85296	22.62 33.68	31474 42648
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	G	IEU	553833 2464	57633 78150	13304 918	12999 896	NC50	6.625 168.28	3.250 82.55	7 177.8	10 254.0	1268963 5645	51217 69450	21.93 32.65	31025 42070
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	G	IEU	553833 2464	57633 78150	13304 918	12999 896	$5\frac{1}{2}$FH	7 177.8	3.75 95.25	8 203.2	10 254.0	1448407 6443	62903 85296	22.62 33.68	31474 42648
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	S	IEU	712070 3168	74100 100480	17105 1180	15672 1081	NC50	6.625 168.28	2.750 69.85	7 177.8	10 254.0	1551706 6903	63393 85961	22.61 33.67	38044 51588
5 127.0	19.50 29.05	0.362 9.19	4.276 108.62	S	IEU	712070 3168	74100 100480	17105 1180	15672 1081	$5\frac{1}{2}$FH	7.25 184.15	3.5 88.90	8 203.2	10 254.0	1619231 7203	72213 97921	23.48 34.96	43490 58972
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	E	IEU	530144 2358	52257 70860	13125 905	13500 931	NC50	6.625 168.28	3.5 88.90	7 177.8	10 254.0	1109920 4937	44156 59876	26.85 39.98	27076 36715
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	E	IEU	530144 2358	52257 70860	13125 905	13500 931	$5\frac{1}{2}$FH	7 177.8	3.5 88.90	8 203.2	10 254.0	1619231 7203	62903 85296	28.27 42.09	37742 51178
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	X	IEU	671515 2987	66192 89756	16625 1147	17100 1179	NC50	6.625 168.28	3 76.20	7 177.8	10 254.0	1416225 6300	57534 78016	27.87 41.50	34680 47026
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	X	IEU	671515 2987	66192 89756	16625 1147	17100 1179	$5\frac{1}{2}$FH	7 177.8	3.5 88.90	8 203.2	10 254.0	1619231 7203	62903 85296	28.59 42.57	37742 51178
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	G	IEU	742201 3302	73159 99204	18375 1267	18900 1303	NC50	6.625 168.28	2.750 69.85	7 177.8	10 254.0	1619231 7203	63393 85961	28.32 42.17	38044 51588
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	G	IEU	742201 3302	73159 99204	18375 1267	18900 1303	$5\frac{1}{2}$FH	7.25 184.15	3.5 88.90	8 203.2	10 254.0	1551706 6903	72213 97921	29.16 43.42	43490 58972
5 127.0	25.60 38.13	0.50 12.70	4.000 101.60	S	IEU	954259 4245	94062 127548	23625 1629	24300 1676	$5\frac{1}{2}$FH	7.25 184.15	3.25 82.55	8 203.2	10 254.0	1778274 7910	78716 106739	29.4343 .82	47230 64044
5 $1\frac{1}{2}$ 139.7	21.90 32.62	0.361 9.17	4.778 121.36	E	IEU	437116 1944	50710 68763	8615 594	8413 580	$5\frac{1}{2}$FH	7 177.8	4 101.60	8 203.2	10 254.0	1265802 5631	55687 75512	23.77 35.39	33560 45507
5 $1\frac{1}{2}$ 139.7	21.90 32.62	0.361 9.17	4.778 121.36	X	IEU	553681 2463	64233 87100	10912 753	10019 691	$5\frac{1}{2}$FH	7 177.8	3.75 95.25	8 203.2	10 254.0	1448407 6443	62903 85296	24.53 36.53	37742 51178
5 $1\frac{1}{2}$ 139.7	21.90 32.62	0.361 9.17	4.778 121.36	G	IEU	611963 2722	70994 96258	12061 832	10753 742	$5\frac{1}{2}$FH	7.25 184.15	3.5 88.9	8 203.2	10 254.0	1619231 7203	72213 97921	25.38 37.79	43490 58972
5 $1\frac{1}{2}$ 139.7	21.90 32.62	0.361 9.17	4.778 121.36	S	IEU	786809 3500	91278 123773	15507 1069	12679 874	$5\frac{1}{2}$FH	7.500 190.50	3 76.20	8 203.2	10 254.0	1925536 8566	86765 117653	26.50 39.46	52302 70922

Table A.1 (end)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
5 $^{1}I_{2}$ 139.7	24.70 36.79	0.415 10.54	4.670 118.62	E	IEU	497222 2212	56574 76714	9903 683	10464 722	5$^{1}I_{2}$FH	7 177.8	4 101.60	8 203.2	10 254.0	1265802 5631	55687 75512	26.33 39.21	33560 45507
5 $^{1}I_{2}$ 139.7	24.70 36.79	0.415 10.54	4.670 118.62	X	IEU	629814 2802	71660 97171	12544 865	12933 892	5$^{1}I_{2}$FH	7.25 184.15	3.5 88.9	8 203.2	10 254.0	1619231 7203	72213 97921	27.85 41.47	43490 58972
5 $^{1}I_{2}$ 139.7	24.70 36.79	0.415 10.54	4.670 118.62	G	IEU	696111 3097	79204 107401	13865 956	14013 966	5$^{1}I_{2}$FH	7.25 184.15	3.5 88.9	8 203.2	10 254.0	1619231 7203	72213 97921	27.85 41.47	43490 58972
5 $^{1}I_{2}$ 139.7	24.70 36.79	0.415 10.54	4.670 118.62	S	IEU	894999 3981	101833 138086	17826 1229	17023 1174	5$^{1}I_{2}$FH	7.500 190.50	3 76.20	8 203.2	10 254.0	1925536 8566	86765 117653	27.77 41.35	52302 70922

Table A.2 – Sizes and Specifications of Drill Pipe Manufactured According to GOST R50278 or TU 14-3-1571:2008/ U 27.2-05757883-200:2008 and Tool Joints According to GOST 27834

Pipe Body										Tool Joint								Assembly	
Specified Size	Specified Weight	Wall Thickness	Inside Diameter	Grade	Upset	Tensile Load	Torque	Internal pressure	Collapse Load	Specified Joint Size	Tool-Joint Thread	Outside Diameter	Inside Diameter	Length of Tongs Area on Pin	Length of Tongs Area on Box	Tensile Load	Torque	Approximate Mass	Makeup Torque
mm	kg/m	mm	mm			kN	Nm	MPa	MPa			mm	mm	mm	mm	kN	Nm	kg	Nm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
73.0	14.46	9.2	51.6	Д	ПВ	698.9	11480	83.78	80.83	ЗП-95-32	З-73	95.2	31.8	179.5	204.2	1783	16767	16.40	8663
				Е		953.3	15650	114.0	109.4										
88.9	18.34	9.4	70.2	Д	ПВ	885.3	18450	70.24	65.73	ЗП-108-44	З-86	108.0	44.5	179.5	229.6	2154	20190	20.90	10210
				Е		1208	25170	95.65	88.50										
	21.79	11.4	66.1	Д	ПВ	1052	20960	85.15	82.40	ЗП-108-41	З-86	108.0	41.3	179.5	229.6	2320	21680	24.38	10635
				Е		1436	28600	116.1	111.6										
101.6	19.27	8.4	84.4	Д	ПВ	930	23150	54.94	74.75	ЗП-133-71	З-108	133.4	71.4	179.5	255.0	2595	30675	22.56	16745
				Е		1269	31580	74.75	64.16										
				Л	ПВ	1607	39990	94.76	78.97	ЗП-133-68	З-108	133.4	68.3	179.5	255.0	2853	33590	22.88	17600
				М		1777	44230	104.8	85.84	ЗП-140-62		139.7	61.9	179.5	255.0	3353	39220	23.55	21580
114.3	22.32	8.6	97.2	Д	ПК	1077	30630	50.03	42.48	ЗП-159-83	З-122	158.8	82.6	179.5	255.0	3227	43145	27.37	26625
				Е		1470	41790	68.08	55.92										
				Л		1762	52910	88.33	68.08	ЗП-159-76		158.8	76.2	179.5	255.0	3827	50740	27.24	29500
				М		2058	58520	95.35	73.58										
	27.84	10.9	92.5	Д		1344	36690	63.37	58.00	ЗП-159-76		158.8	76.2	179.5	255.0	3827	50740	33.19	29500
				Е		1834	50050	86.23	77.70										
				Л		2322	63370	109.40	96.73	ЗП-159-70		158.8	69.9	179.5	255.0	4374	57685	633.73	31880
				М		2568	70080	120.90	105.9	ЗП-159-63		158.8	63.5	179.5	255.0	4888	64160	34.10	33915
127.0	26.70	9.2	108.6	Д	ПК	1290	40910	48.17	40.32	ЗП-162-95-2	З-133	161.9	95.3	179.5	255.0	3320	47580	31.22	26880
				Е		1759	55810	65.53	52.78										
				Л		2277	70670	83.09	63.96	ЗП-162-89-2		161.9	88.9	179.5	255.0	4005	56880	31.94	29820
				М		2464	78160	91.82	68.96	ЗП-165-83		165.1	82.6	179.5	255.0	4633	65500	32.78	34240

Table A.2 (end)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
127.0	35.80	12.7	101.6	Д	ПК	1728	51960	66.41	61.41	ЗП-162-89-2	З-133	161.9	88.91	179.5	255.0	4005	56880	40.60	29820
				Е		2358	70880	90.45	82.60										
				Л		2985	89750	114.70	103.1	ЗП-165-76		165.1	76.2	179.5	255.0	5234	73675	41.84	36540
				М		3301	99260	126.70	113.0	ЗП-168-70		168.3	69.9	179.5	255.0	5787	81110	42.47	40300
60.3	9.33	7.1	46.1	Д	ПН	450.6	6210	78.20	74.65	ЗП-86-44	З-73	85.7	44.5	179.5	204.2	1110	8892	10.54	4152
				Е		614.7	8471	106.5	100.9										
				Л		777.8	10720	135.0	126.8										
				М		859.3	11850	149.2	139.5										
73.0	14.46	9.2	54.6	Д	ПН	698.9	11480	83.78	80.83	ЗП-105-54	З-86	104.8	54.0	179.5	229.6	1597	15137	16.41	7990
				Е		953.3	15650	114.0	109.4										
				Л		1206.0	19820	144.5	137.7	ЗП-105-51			50.8			1795	16930	16.58	8522
				М		1332.0	21900	159.7	151.6										
88.9	18.31	9.4	70.2	Д	ПН	885.3	18450	70.24	65.73	ЗП-121-68	З-102	120.7	68.3	204.9	267.7	2119	23250	21.08	11615
				Е		1208.0	25170	95.65	88.50										
				Л		1530.0	31870	121.3	110.9	ЗП-127-65		127.0	65.1	204.9	267.7	2370	25900	2173	14275
				М		1691.0	35250	134.0	121.6	ЗП-127-62		127.0	61.9	204.9	267.7	2610	28450	21.90	15090
	21.79	11.4	66.1	Д		1052.0	20960	85.15	82.40	ЗП-127-65	З-102	127.0	65.1	204.9	267.7	2370	25900	25.03	14275
				Е		1436.0	28600	116.1	111.6										
				Л		1817.0	36210	147.2	140.6	ЗП-127-62		127.0	61.9	204.9	267.7	2610	28450	25.28	15090
				М		2011.0	40050	163.5	154.8	ЗП-127-94		127.0	54.0	204.9	267.7	3160	34235	25.65	16755
101.6	19.27	8.4	84.8	Д	ПН	930.0	23150	54.94	48.27	ЗП-152-83	З-122	152.4	82.6	179.5	255.0	3227	43165	23.75	24445
				Е		1269.0	31580	74.75	64.16										
				Л		1607.0	39990	94.76	78.97									23.88	
				М		1777.0	44230	104.8	85.84										
114.3	22.32	8.6	97.2	Д		1077	30630	50.03	42.48	ЗП-162-95-1	З-133	161.9	95.3	179.5	255.0	3320	47580	26.75	26880
				Е		1470	41790	68.08	55.92										
				Л		1762	52910	88.33	68.08									26.90	
				М		2058	58520	95.35	73.58										
	27.84	10.9	92.7	Д	ПН	1344	36690	63.37	58.00	ЗП-162-92			92.1	179.5	255.0	3668	52290	32.98	28420
				Е		1834	50050	86.23	77.70										
				Л		2322	63370	109.4	96.73	ЗП-162-89-1			88.9	179.5	255.0	4005	56880	32.77	29820
				М		2568	70080	120.9	105.9										
127.0	26.70	9.2	108.6	Д	ПН	1290	40910	48.17	40.32	ЗП-178-102	З-147	177.8	101.6	204.9	255.0	4590	71985	33.00	37533
				Е		1759	55810	65.53	52.78										
				Л		2277	70670	83.09	63.96										
	35.80	12.7	101.6	Д		1728	51960	66.41	61.41				101.6	204.9	255.0	4590	71985	42.05	
				Е		2358	70880	90.45	82.60										
				Л		2985	89750	114.7	103.1	ЗП-178-95			95.3	204.9	255.0	5317	82865	43.00	40535

Annex B
(informative)
Interchangeability of National Tool-Joint Threads and International Threads

Tool-Joint Thread	Thread Pitch, mm	Taper	Corresponding Thread According to API Spec 7	Profile Form According to GOST	Profile Form According to API Spec 7
3-65	6.35	1:6	NC-23	IV	V-0.038 R
3-66	5.08	1:4	2 3/8 Reg	I	V-0.040
3-73	6.35	1:6	NC-26	IV	V-0.038 R
3-76	5.08	1:4	2 7/8 Reg	I	V-0.040
3-86	6.35	1:6	NC-31	IV	V-0.038 R
3-88	5.08	1:4	3 1/2 Reg	I	V-0.040
3-94	6.35	1:6	NC-35	IV	V-0.038 R
3-101	5.08	1:4	3 1/2 FH	I	V-0.040
3-102	6.35	1:6	NC-38	IV	V-0.038 R
3-108	6.35	1:6	NC-40	IV	V-0.038 R
3-117	5.08	1:4	4 1/2 Reg	I	V-0.040
3-118	6.35	1:6	NC-44	IV	V-0.038 R
3-121	5.08	1:4	4 1/2 FH	I	V-0.040
3-122	6.35	1:6	NC-46	IV	V-0.038 R
3-133	6.35	1:6	NC-50	IV	V-0.038 R
3-140	6.35	1:4	5 1/2 Reg	II	V-0.050
3-147	6.35	1:6	5 1/2 FH	III	V-0.050
3-149	6.35	1:4	NC-56	V	V-0.038 R
3-152	6.35	1:6	6 5/8 Reg	III	V-0.050
3-161	6.35	1:6	-	III	-
3-163	6.35	1:4	NC-61	V	V-0.038 R
3-171	6.35	1:6	6 5/8 FH	III	V-0.050
3-177	6.35	1:4	7 5/8 Reg	II	V-0.050
3-185	6.35	1:4	NC-70	V	V-0.038 R
3-189	6.35	1:6	-	III	-
3-201	6.35	1:4	8 5/8 Reg	II	V-0.050
3-203	6.35	1:4	NC-77	V	V-0.038 R

Annex C
(informative)
List of Referenced Documents

1 GOST R 50278-92 Drill pipe with welded-on tool joints. Specification.

2 GOST 27834-95 Tool joints for drill pipe. Specification.

3 GOST 28487-90 Tool-joint taper thread for drill string elements. Profile. Dimensions. Tolerances.

4 GOST 4543-71 Structural alloy steel bars. Specifications.

5 API Spec 5DP Specification for Drill Pipe.

6 API Spec 7-2 Specification for Threading and Gauging of Rotary Shouldered Thread Connections.

7 ISO 10400:1993 Petroleum and natural gas industries – Formulae and calculation for casing, tubing, drill pipe and line pipe properties – Specification.

8 ISO 11961:1993 Petroleum and natural gas industries - Steel pipes for use as drill pipe – Specification.

9 RD 08-624-03 Petroleum and Natural Gas Industry Safety Code

10 RD 39-2-1269-85 OCTG handling in the pipe yards. Code of Practice.

11 RD 39-013-90 Drill-Pipe Operation Manual. Kuybyshev, 1990.

12 TU 14-161-137-94 Drill pipe 60-89 mm in diameter with welded-on tool joints.

13 TU 14-161-138-94 Drill pipe БК-127, 127 mm in diameter with welded-on tool joints of improved reliability.

14 TU 14-161-141-94 Drill pipe БК-114 with welded-on tool joints of reduced diameter.

15 TU 14-161-217-2003 Flush-joint light-weight drill pipe of small diameter.

16 TU 14-161-219-2004 Drill pipe with welded-on tool joints (high-torque).

17 TU 14-161-221-2005 Drill pipe with welded-on tool joints of X95S grade in H2S-resistant version.

18 TU 14-161-235-2009 Drill pipe with welded-on tool joints «TMK TDS».

19 TU 14-3-1571-2008/TU U 27.2-05757883-200:2008 Drill pipe with welded-on tool joints.

20 TU 14-157-107-2009 Drill pipe with welded-on tool joints TMK TDS.

21 TU 14-3-1849-92 Drill pipe БК-73, 73 mm in diameter with welded-on tool joints.

22 TU 1324-138-00147016-02 Process drill pipe and tool joints for them.

23 Drill-String Design Code. Moscow, 1997.

24 Regulations for accounting of casing, drill pipe and tubing turnover at the enterprises of the Petroleum Industry Ministry. Moscow, 1987.

Annex D
Charts of Combined Bending, Torsional and Tensile Loads for Drill Pipe and Tool Joints

Certified the foregoing Document to be a true, complete, and accurate English translation of the original document translated from Russian by the INTERSERVICE translation agency.

A.Itskovich
Director

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