

ZAO VNIITneft
R&D Institute for OCTG Design and Operation
Private Stock Company

ENDORSED by:

A.A. Klachkov
Deputy CEO, Chief Engineer, OAO TMK
_____, 2010

APPROVED by:

Y.N. Antipov
CEO, ZAO VNIITneft
_____, 2010

PIPE FOR USE AS CASING FOR WELLS
OPERATION MANUAL

DEVELOPED by:

A.A. Donskoy
CTO, ZAO VNIITneft
_____, 2010

Samara, 2010

TABLE OF CONTENTS

1	Terms and Definitions.....	4
2	Pipe Specifications.....	5
3	Marking and Packing	16
3.1	Marking of Pipe	16
3.2	Packing of Pipe.....	23
4	Good Practice for Pipe Operation – Requirements and Recommendations	26
4.1	Pipe Pre-operation Requirements	26
4.2	Casing String Forming	28
4.3	Running Casing	29
4.4	Running Casing Equipment Requirements	34
4.5	Thread Compound Selecting Recommendations	34
4.6	Monitoring Casing in Service.....	36
4.7	Care of Casing in Hole	37
4.8	Recovery of Casing	37
4.9	Basic Recommendations for Prevention of Emergencies	37
5	Transportation and Storage	38
5.1	Transportation.....	38
5.2	Storage.....	38
6	Safety Requirements	39
7	Manufacturer's Guarantee	39
	Annex A Strength Properties and Makeup Torque Values for Casing Made to GOST 632	40
	Annex B List of Referenced Documents	54
	Abbreviations Used in This Document.....	56

This Manual covers the range of casing manufactured to GOST 632, GOST R 53366-2009 (ISO 11960:2004), API Spec 5CT and specifications (TU) applied at Pipe Metallurgical Company (OAO TMK).

All casing manufactured according to GOSTs, specifications, API standard listed herein may be used for oil and gas well casing, provided the recommendations given below are considered.

This Manual is intended to neither withdraw nor contradict the current normative documents listed in Annex B, but rather to supplement and specify the particular features inherent to the operation of casing manufactured by OAO TMK.

This Manual supersedes the current version issued by ZAO VNIITneft in 2005.

This Manual covers all the occupational health and safety requirements applicable to the operation of casing at oil/gas production facilities.

The pipe data contained herein were taken from product specifications and are provided for general reference. Detailed technical data shall be sought in applicable specifications.

OAO TMK guarantees proper quality of pipe used in operation, provided all the requirements herein contained are complied with.

This Manual is supplied with each delivered lot of pipe and shall be binding upon the Customers.

1 Terms and Definitions

Casing – pipe run from the surface and intended to line the walls of a drilled well.

Coupling – internally threaded cylinder for joining two lengths of threaded pipe.

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

Heat – metal produced by a single cycle of a melting process.

Seamless pipe – wrought steel tubular product made without a weld seam.

Supplier – a firm, company or organization performing the delivery of certain type of product, which certifies and bears responsibility for the conformity of delivered product to all details contained in the certificate and to the requirements of specifications, GOSTs and other technical documents.

Customer – a party responsible for the definition of purchase order requirements and for the settlement of the purchase order.

Schedule – pipe description denoting pipe application, pipe body outside diameter, wall thickness, pipe grade or steel grade.

Thread protector – component (*cap, ring, insert or pin*) used to protect threads and seals during storage, transportation and handling.

Connection – threaded assembly of tubular components.

Hand-tight makeup – sufficiently tight so that the coupling cannot be removed except by use of a wrench.

Casing accessory – one-piece tubular section (crossover connector, swage, nipple, flow coupling, etc.) used in a pipe string to provide mechanical and pressure integrity within the pipe string and facilitate the performance of some other functions required of that pipe string.

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

Standard specifications for manufacture and delivery of tubular goods – standards, specifications, technical appendices to agreements/contracts for manufacture and delivery of pipe.

Specifications (TU) – technical document prepared according to designer's (manufacturer's) decision or at customer's request, which contains the complete set of requirements applicable to product, its manufacture and inspection.

Visual inspection – organoleptic examination by the organs of vision.

Measuring control – control by use of measuring equipment.

Imperfection – discontinuity in the product wall or on the product surface that can be detected by NDT methods.

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

Pipe mill – firm, company or corporation that operates pipe-making facilities.

Processor – firm, company or corporation that operates facilities capable of heat-treating pipe made by a pipe mill.

Threader – firm, company or corporation that operates facilities capable of threading and have thread gauges required to control the threads.

Manufacturer – one or more of the following, as the case may be: pipe mill; processor; threader; coupling manufacturer or pup-joint manufacturer; accessory manufacturer.

2 Pipe Specifications

2.1 Range of casing manufactured by TMK pipe mills is given in Table 1.

Table 1 – Range of casing manufactured by TMK mills

Designation of standard specification	Pipe dimensions				Pipe grade	Thread connection
	Diameter, mm		Wall thickness, mm	Length, m		
	specified	nominal				
1	2	3	4	5	6	7
GOST 632-80 Casing and casing couplings – Specifications	114	114.3	5.2; 5.7	6.0-12.0	Д	round
			6.4		Д,К,Е,Л,М	round,
			7.4*		Д,К,Е,Л,М Р	OTTM
			8.6*; 10.2		Д,К,Е,Л,М Р	round, OTTM, OTTG
	127	127.0	5.6	6.0-12.0	Д	Round
			6.4		Д,Е,Л,М	round,
			7.5		Д,К,Е,Л,М,Р	OTTM
			9.2; 10.2		Д,К,Е,Л,М,Р	round, OTTM, OTTG
	140	139.7	6.2	6.0-12.0	Д	round,
			7.0		Д,К,Е,Л,М	OTTM
			7.7		Д,К,Е,Л,М,Р	
			9.2; 10.5		Д,К,Е,Л,М,Р	round, OTTM, OTTG
	146	146.1	6.5	6.0-12.0	Д	round, OTTM
			7.0; 7.7. 8.5;		Д,К,Е,Л,М	round, OTTM
			9.5; 10.7		Д,К,Е,Л,М,Р	round, OTTM, OTTG

Table 1 (continued)

1	2	3	4	5	6	7
GOST 632-80 Casing and casing couplings – Specifications	168	168.3	7.3	6.0-12.0	Д,К,Е,Л	round, OTTM
			8.0; 8.9		Д,К,Е,Л,М	round, OTTM, OTTG
			10.6; 12.1		Д,К,Е,Л,М	
	178	177.8	8.1; 13.7	6.0-12.0	Д,К,Е,Л,М	round, OTTM
			9.2; 10.4; 11.5; 12.7;			round, OTTM, OTTG
	194	193.7	7.6	6.0-12.0	Д,К,Е,Л,М	round, OTTM
			8.3			round, OTTM, OTTG
			9.5; 10.9; 12.7; 15.1			
	219	219.1	7.7	6.0-12.0	Д	round, OTTM
			8.9; 10.2; 11.4; 12.7; 14.2		Д,К,Е,Л,М,Р	round, OTTM, OTTG
	245	244.5	7.9	6.0-12.0	Д	round, OTTM
			8.9; 10.0; 11.1; 12.0; 13.8; 15.9		Д,К,Е,Л,М,Р	round, OTTM, OTTG
	273	273.1	8.9	6.0-12.0	Д,К,Е,Л,М	round, OTTM, OTTG
			10.2; 11.4; 12.6; 13.8; 15.1; 16.5		Д,К,Е,Л,М,Р	
	324	323.9	8.5	6.0-12.0	Д	round, OTTM
			9.5		Д,Е,Л	
			11.0; 12.4; 14.0		Д,К,Е,Л,М,Р	
GOST R 53366-2009 (ISO 11960:2004) Petroleum and natural gas industries – Steel pipe for use as casing or tubing for wells – General specifications	101	101.6	6.5	length range II, III	J55 L80; C95; P110	OTTM
	114	114.3	5.21; 5.69		H40; J55; K55; M65	round
			6.35; 7.37; 8.56		H40; J55; K55; M65; L80 type 1; N80; C90; C95; P110; Q125; Q135	round, OTTM, OTTG, BC
			10.2		H40; J55; K55; M65; L80 type 1; N80; C90; T95; C95; P110	
	127	127.0	5.59		J55; K55; M65	round
			6.43;		J55; K55; L80 type 1; N80; C90; T95; C95; P110	round, OTTM, OTTG, BC
			7.52		J55; K55; L80 type 1; N80; C90; T95; C95; P110; Q135	
			9.19; 11.10		J55; K55; L80 type 1; N80; C90; T95; C95; P110; Q125; Q135	
			10.7;		J55; K55; ; L80 type 1; N80; C95; P110; Q125; Q135	
			12.14; 12.70		J55; K55; L80 type 1; N80; C90; C95; P110; Q125	round, OTTM
					H40; J55; K55; M65; N80	
	140	139.7	6.20		H40; J55; K55; L80 type 1; N80; C90; T95; C95; P110	round, OTTM, OTTG, BC
			6.98		H40; J55; K55; L80 type 1; N80; C90; T95; C95; P110; Q125; Q135	
			7.72; 9.17; 10.54			

Table 1 (continued)

1	2	3	4	5	6	7
GOST R 53366-2009 (ISO 11960:2004) Petroleum and natural gas industries – Steel pipe for use as casing or tubing for wells – General specifications	146	146.1	6.50		H40; J55; K55; M65; N80	round, OTTM, BC
			7.00; 7.70		H40; J55; K55; L80 type 1; N80; C90; T95; C95; P110	round OTTM, BC
	146	146.10	8.50; 9.50; 10.70	length range II, III	H40; J55; K55; L80 type 1; N80; C90; T95; C95; P110; Q125; Q135	round OTTM, OTTF, BC
	168	168.28	7.32		H40; J55; K55; M65; N80	round, OTTM, BC
			8.00		H40; J55; K55; M65; L80 type 1; N80; C95; P110	round OTTM, OTTF, BC
			8.94; 10.59; 12.06		H40; J55; K55; M65; L80 type 1; N80; C90; T95; C95; P110; Q125; Q135	round OTTM, OTTF, BC
	178	177.80	8.05		H40; J55; K55; M65; L80 type 1; N80; C90; T95; C95	round OTTM, OTTF, BC
			9.19; 10.36; 11.51; 12.65		H40; J55; K55; M65; L80 type 1;; N80; C90; T95; C95; P110	round OTTM, OTTF, BC
			13.72		L80 type 1; N80; C90; T95; C95; P110	round OTTM, OTTF, BC
	194	193.68	7.60		H40; J55; K55	round OTTM, BC
			8.33; 9.52; 10.92; 12.70		H40; J55; K55; N80; L80 type 1; C90; T95;; C95; P110; Q125; Q135	round OTTM, OTTF, BC
	219	219.08	7.7		H40; J55; K55; M65; N80	round OTTM, BC
			8.94; 10.16; 11.43; 12.70		H40; J55; K55; N80; L80 type 1; C90; T95; C95; P110; Q125; Q135	round OTTM, OTTF, BC
			14.15		L80 type 1; N80; C90; T95 C95; C90; T95; P110; Q125; Q135	round OTTM, OTTF, BC
	245	244.48	7.92		H40; J55; K55; N80	round OTTM, BC
			8.94; 10.03; 11.05; 11.99; 13.84		H40; J55; K55; M65; L80 type 1; N80; C90; T95; C95; P110; Q125; Q135	round OTTM, OTTF, BC
			15.11		L80 type 1; N80; C95; C90; T95; P110; Q125; Q135	round OTTM, OTTF, BC
	273	273.10	8.89;		H40; J55; K55; M65; L80 type 1; N80; C90; T95; C95; P110	
			10.16; 11.43; 12.57; 13.84		J55; K55; M65; L80 type 1; N80; C95; C90; T95; P110; Q125; Q135	round BC OTTM, OTTF

Table 1 (continued)

1	2	3	4	5	6	7
GOST R 53366-2009 (ISO 11960:2004) Petroleum and natural gas industries – Steel pipe for use as casing or tubing for wells – General specifications	273	273.10	15.11		L80 Type 1; N80; C95; C90; T95; P110; Q125; Q135	round OTTM, OTTG, BC
			16.50		J55; K55; L80 Type 1; C95; P110; Q135	round OTTM, OTTG, BC
	324	323.90	8.50		H40; J55; K55; M65; L80 Type 1; C95; P110	round OTTM, BC
			9.50; 11.10; 12.40; 14.0		H40; J55; K55; M65; L80 Type 1; N80; C95; C90; T95; P110; Q125; Q135	round OTTM, OTTG, BC
			8.38		H40; J55; K55	round
	340	339.70	9.65; 10.92		H40; J55; K55; M65; L80 Type 1; N80; C95; C90; T95;	round OTTM, BC
			12.19;		H40; J55; K55; M65; L80 Type 1; N80; C95; C90; T95; P110	
			13.06		H40; J55; K55; L80 Type 1; N80; C95; C90; T95; P110; Q125; Q135	round OTTM, BC
API Spec 5CT / ISO 11960:2004 Eighth edition Specification for Casing and Tubing / Petroleum and natural gas industries – Steel pipe for use as casing or tubing for wells	114	114.3	6.35; 7.37; 8.56;	length range II, III	H40; J55; K55; M65; L80 Type 1; N80; C90; T95; C95; P110; Q125	round, BC, TMK FMC LC, STC, TMK GF TMK PF, TMK PF ET, TMK CS, TMK TTL -01, TMK 1
	127	127.0	6.43; 7.52; 9.19; 10.16; 11.10; 12.14; 12.70			
	140	139.7	6.99; 7.72; 9.17; 10.54			
	168	168.28	7.32; 8.94; 10.59; 12.06			
	178	177.8	8.05; 9.19; 10.36; 11.51; 12.65; 13.72			
	194	193.68	8.33; 9.52; 10.92; 12.70			
	219	219.08	8.94; 10.16; 11.43; 12.70; 14.15			
	245	244.48	8.94; 10.03; 11.05; 11.99; 13.84; 15.11			
	273	273.1	8.89; 10.16; 11.43; 12.57; 13.84; 15.11			
	340	339.7	9.65; 10.92; 12.19; 13.06			
TU 39.0147016-63-96 Casing and casing couplings with buttress thread	114	114.3	7.4; 8.6; 10.2	to GOST 632-80	Д, К, Е, Л	type BC
	127	127	7.5; 9.2; 10.7			
	140	139.7	7.0; 7.7; 9.2; 10.5			
	146	146.1	7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	7.3; 8.0; 8.9; 10.6; 12.1			
	178	177.8	8.1; 9.2; 10.4; 11.5; 12.7; 13.7			
	194	193.7	7.6; 8.3; 9.5; 10.9; 12.7			
	219	219.1	7.7; 8.9; 10.2; 11.4; 12.7; 14.2			
	245	244.5	7.9; 8.9; 10.0; 11.1; 12.0; 13.8			

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-162-13-95 Seamless casing with buttress thread connection and couplings thereto	219	219.1	8.9; 10.2; 11.4; 12.7; 14.2	6.0-12.0	Д, Е, Л, М	type BC
	245	244.5	7.9; 8.9; 10.0; 11.1; 12.0; 13.8			
	273	273.1	8.9; 10.2; 11.4; 12.6; 13.8; 15.1			
	324	323.9	9.5; 11.0; 12.4; 14.0			
TU 14-161-175-98 Steel casing and couplings thereto	114	114.3	6.4	9.5-13.0	Д	round thread
			6.4		Д,Е,Л,М	ОТТМ, ОТТГ, type BC
			7.4; 8.6		Д,Е,Л,М,Р	
			10.2		Л,М,Р	
	127	127.0	5.6; 6.4; 7.5		Д	round
			6.4; 7.5; 9.2; 10.2		Д,Е,Л,М,Р	ОТТМ, ОТТГ, type BC
	140	139.7	6.2; 7.0; 7.7		Д	round
			6.2; 7.0; 7.7; 9.2; 10.5		Д,Е,Л,М,Р	ОТТМ, ОТТГ, type BC
TU 14-161-175-98 Steel casing and couplings thereto	146	146.1	6.5; 7.0; 7.7	9.5-13.0	Д	round
			6.5; 7.0		Д	round, ОТТМ, ОТТГ, type BC
			7.7		Д	round
			7.7		Д,Е,Л,М	ОТТМ, ОТТГ, type BC
			8.5; 9.5; 10.7		Д,Е,Л,М,Р	
	168	168.3	7.3; 8.9		Д	round
			8		Д,Е	ОТТМ, ОТТГ, type BC
			7.3; 8.0; 8.9; 10.6; 12.1		Д,К,Е,Л,М	
TU 14-157-24-92 Casing and casing couplings, cold-resistant	114	114.3	8.6; 10.2	9.3-12.0	Д,Е,К,Л,М,Р	ОТТГ исп. А ТМК FMC
	127	127.0	9.2; 10.7			
	140	139.7	9.2; 10.5			
	146	146.1	8.5; 9.5; 10.7			
	168	168.3	8.9; 10.6; 12.1			
	178	177.8	9.2; 10.4; 11.5; 12.7			
	194	193.7	9.5; 10.9; 12.7			
	219	219.1	8.9; 10.2; 11.4; 12.7; 14.2			
	245	244.5	8.9; 10.0; 11.1; 12.0; 13.8			
TU 14-ZR-76-2004 Casing and casing couplings, cold-resistant	168	168.3	10.6; 12.1	6-11.7	Д,К,Е, Л,М	ОТТГ, ОТТМ
	178	177.8	9.2; 10.4; 11.5; 12.7			
	219	219.1	8.9; 10.2; 11.4; 12.7			
	245	244.5	8.9; 10.0; 11.1; 12.0			
	324	323.9	9.5; 11.0; 12.4			
TU 14-157-77-01 Seamless steel casing, cold-resistant, with ОТТГ, ОТТМ thread connections	114	114.3	7.4; 8.6; 10.2	9.5-12.0	Д, К, Е,Л,М	ОТТМ, ОТТГ
	127	127.0	7.5; 9.2; 10.7			
	140	139.7	7.0; 7.7; 9.2; 10.5			
	146	146.1	7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	7.3; 8.0; 8.9; 10.6; 12.1			
	178	177.8	8.1; 9.2; 10.4; 11.5; 12.7; 13.7			
	194	193.7	7.6; 8.3; 9.5; 10.9; 12.7			

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-157-77-01 Seamless steel casing, cold-resistant, with OTTГ, OTTM thread connections	219	219.1	7.7; 8.9; 10.2; 11.4; 12.7; 14.2	9.5-12.0	Д, К, Е,Л,М	ОТТМ, ОТТГ
	245	244.5	8.9; 10.0; 11.1; 12.0; 13.8			
TU 14-161-149-94 Casing and casing couplings, H ₂ S-resistant and cold-resistant	114	114.3	5.2; 5.7			
			6.4; 7.4; 8.6; 10.2		Дс,Кс,Ес	ОТТМ, ОТТГ, type BC
	127	127.0	6.4		Дс	round
			5.6; 6.4; 7.5; 9.2; 10.2		Дс,Кс,Ес	ОТТМ, ОТТГ, type BC
	140	139.7	6.2; 7.0; 7.7; 9.2; 10.5		Дс,Кс,Ес	round
TU 14-161-180-99 Seamless casing and couplings thereto, H ₂ S- resistant, CO ₂ -resistant and cold-resistant	146	146.1	6.5; 7.0; 7.7; 8.5; 9.5; 10.7		Дс,Кс,Ес	ОТТМ, ОТТГ, type BC
	114	114.3	5.2; 5.7; 6.4; 7.4; 8.6; 10.2	9.5-13	Дс,Кс,Ес,Лс	round
			6.4; 7.4; 8.6; 10.2		Дс,Кс,Ес,Лс	ОТТМ, ОТТГ, type BC
	127	127	6.4; 7.5; 9.2; 10.2		Дс,Кс,Ес,Лс	round
			5.6; 6.4; 7.5; 9.2; 10.2		Дс,Кс,Ес,Лс	ОТТМ, ОТТГ, type BC
	140	139.7	6.2; 7.0; 7.7; 9.2; 10.5		Дс,Кс,Ес,Лс	round,
TU 14-161-193-2001 Seamless casing and couplings thereto, H ₂ S- resistant, CO ₂ -resistant and cold-resistant	146	146.1	6.5; 7.0; 7.7; 8.5; 9.5; 10.7		Дс,Кс,Ес,Лс	ОТТМ, ОТТГ, type BC
				9.5-13		
					Дс,Кс,Ес,Лс	round
					Дс,Кс,Ес,Лс	round, ОТТМ, type BC
	114	114.3	5.2; 5.7		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ, type BC
			6.4; 7.4		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ
			8.6		Дс,Кс,Ес,Лс	round, ОТТМ, type BC
			10.2		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ
	127	127	5.6		Дс,Кс,Ес,Лс	round
			6.4; 7.5		Дс,Кс,Ес,Лс	round, ОТТМ, type BC
			9.2		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ, type BC
			10.2		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ
	140	139.7	6.2		Дс,Кс,Ес,Лс	round
			7.0; 7.7		Дс,Кс,Ес,Лс	round, ОТТМ, type BC
			9.2; 10.5		Дс,Кс,Ес,Лс	round, ОТТМ, ОТТГ, type BC
					Дс,Кс,Ес,Лс	round, type BC

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-193-2001 Seamless casing and couplings thereto, H ₂ S-resistant, CO ₂ -resistant and cold-resistant	146	146.1	7.0; 7.7	9.5-13	Дс,Кс,Ес,Лс	round, OTTM, type BC
			8.5; 9.5; 10.7		Дс,Кс,Ес,Лс	round, OTTM, OTTG, type BC
	168	168.3	7.3; 8.0; 8.9; 10.6		Дс,Кс,Ес,Лс	round, OTTM, type BC
TU 14-157-47-97 Casing and casing couplings with buttress thread, corrosion-resistant and cold-resistant	114	114.3	8.56-10.2	range I 7.62-10.36	J55, K55, N80, C95	type BC
	127	127	7.52-10.7			
	140	139.7	7.72-10.5			
	146	146.1	7.00; 7.70; 8.50; 9.50; 10.70	range II 10.36-12.0		
	168	168.28	7.32; 8.94; 10.59; 12.07			
	178	177.88	8.05; 9.19; 10.36; 11.51; 12.65; 13.72			
TU 14-157-47-97 Casing and casing couplings with buttress thread, corrosion-resistant and cold-resistant	194	193.68	8.33; 9.53; 10.92; 12.70; 14.27; 15.11; 15.88	range II 10.36-12.0	J55, K55, N80, C95	type BC
	219	219.08	8.94; 10.16; 11.43; 12.70; 14.15			
	245	244.48	8.94; 10.03; 11.05; 11.99; 13.84; 15.11			
TU 14-ZR-29-2007 Steel casing, seamless and electric-welded, and couplings thereto, heavy-duty, with buttress thread connection	114	114.3	6.4; 7.4; 8.6; 10.2	9.5-13.0	Д,Е,Л,М;Р	type BC
	127	127	6.4; 7.5; 9.2; 10.7			
	140	139.7	6.2; 7.0; 7.7; 9.2; 10.5		Дс1; Дс2 Д,Е,Л,М;Р	
	146	146.1	6.5; 7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	7.3; 8.0; 8.9; 10.6; 12.1			
	178	177.8	6.9; 8.1; 9.2; 10.4; 11.5; 12.7; 13.7; 15.0			
	194	193.7	7.6; 8.3; 9.5; 10.9; 12.7; 15.1			
	219	219.1	7.7; 8.9; 10.2; 11.4; 12.7; 14.2			
	245	244.5	7.9; 8.9; 10.0; 11.1; 12.0; 13.8; 15.9			
	273	273.1	8.89; 10.16; 11.43; 12.57; 13.84; 15.11			
	324	323.9	8.2; 9.5; 11.0; 12.4; 14.0			
	340	339.7	9.65; 10.92; 12.19; 13.06			
TU 14-157-11-98 Steel casing with packing assembly made of polymeric material	140	139.7	7.0; 7.7	to GOST 632-80 6.0-12.0	Д,Е,Л,М	OTTM
			9.2; 10.5			OTTM, OTTG
	146	146.1	7.0; 7.7			OTTM
			8.5; 9.5; 10.7			OTTM, OTTG
	168	168.3	7.3; 8.0			OTTM
			8.9; 10.6; 12.1			OTTM, OTTG
	178	177.8	8.1; 13.7			OTTM
			9.2; 10.4; 11.5; 12.7; 13.7			OTTM, OTTG
	219	219.1	7.7; 8.9;			OTTM
			10.2; 11.4; 12.7; 14.2			OTTM, OTTG
245	244.5	7.9;	OTTM			
		8.9; 10.0; 11.1; 12.0; 13.8	OTTM, OTTG			

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-162-102-2000 Longitudinal electric-welded casing and couplings thereto	219	219.1	7.7-10.2	9.0-12.0	Дс1, Дс2	ОТТМ, type BC
	245	244.5	7.9-10.0			ОТТМ
	273	273.05	8.9-11.4			
	324	323.9	8.9-11.0			
TU 14-157-75-2001, TU 14-157-83-2002, TU 14-157-91-2003, TU 14-157-92-2003 Casing with TMK-FMC enhanced leak resistance thread connection and couplings thereto	114	114.3	8.6; 10.2	9.5-11.8	J55, K55, N80, L80, C95, P110 Д,Е,Л,М	TMK-FMC
	127	127.0	9.2; 10.7			
	140	139.7	7.0; 7.7; 9.2; 10.5			
	146	146.1	7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	8.9; 10.6; 12.1			
TU 14-157-75-2001, TU 14-157-83-2002, TU 14-157-91-2003, TU 14-157-92-2003 Casing with TMK-FMC enhanced leak resistance thread connection and couplings thereto	178	177.8	9.2; 10.4; 11.5; 12.7; 13.7; 15.0	9.5-11.8	J55, K55, N80, L80, C95, P110 Д,Е,Л,М	TMK-FMC
	194	193.7	9.5; 10.9; 12.7; 15.1			
	219	219.1	8.9; 10.2; 11.4; 12.7; 14.2			
	245	244.5	8.9; 10.0; 11.1; 12.0; 13.8; 15.9			
TU 14-162-41-98 Seamless casing, enhanced leak resistance, size 324 mm, with OTTF thread connection, and couplings thereto	324	323.9	9.5; 11.0; 12.4; 14.0	9.5-12.0	Д,Е,Л,М	ОТТГ
TU 14-162-53-2004 Casing TTL-01 and couplings thereto for directional and horizontal holes with hole deviation rate up to 5°/10 m	219		10.2; 11.4; 12.7; 14.2	limited 8.0-12.0	Д,Е,Л,М,Р	TTL-01
	245		10.0; 11.1; 12.0; 13.8; 15.9			
	324		11.0; 12.4; 14.0			
TU 1321-197-00147016-01 Extreme-line steel casing	114	114.3	6.4; 7.4	9.5-13	Д, К, Е, Л, М Дхл, Кхл, Ехл, Лхл, Мхл	according to TU
	120	120.0	6.9			
	127	127.0	6.4; 7.5			
	140	139.7	7.0; 7.7			
TU 1321-205-00147016-01 Casing and casing couplings, CO ₂ -resistant and H ₂ S-resistant	219-339	219.1-339.7	7.3-16.5	9.5-13	Е, Л	ОТТМ, ОТТГ, type BC

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-3-714-78, TU 14-157-76-2001 Plain-end extreme-line casing with OГ1M thread connection	140	139.7	10.5; 12.7	9.5-12.0	Д,Е,Л,М	ОГ1М
	168	168.3	10.6; 12.1			
	194	193.7	10.9			
	198	198.0	17.1			
TU 39-0147016-106- 2000 Steel casing, internal- flush, and couplings thereto	114	114.3	7.0 7.4; 8.6	9.5-13	Д,К,Е,Л,М	buttress
	127	127.0	5.6; 6.4; 7.0; 7.5; 9.2			
	140	139.7	7.0; 7.7; 9.2; 10.5			
	146	146.1	6.5; 7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	7.3; 8.0; 8.9; 10.6; 12.1			
TU 14-161-162-95 Casing and casing couplings for wellhead completion	114	114.3	6.4; 7.4; 8.6; 10.2; 10.5	9.5-13	Д	round, OTTM
	140	139.7	7.0; 7.7; 9.2; 10.5			type BC
	146	146.1	7.0; 7.7; 8.5; 9.5; 10.7			
TU 14-161-163-96 Casing 102, 110 mm in diameter with subsize couplings	102	102.0	6.5	9.5-13	Д,Е,Л,М	round, OTTM, OTTГ, type BC
	110	110.0				
TU 14-161-204-2002 Steel casing, cold- resistant, and couplings thereto for gas and gas- condensate fields	102	101.6	6.5	9.5-13 Allowed in Б make lengths by customer's agreement	Д,Е,Л,М,Р	round, OTTM
	110	110.0	6.5			OTTM
	114	114.3	5.2; 5.7			round
			6.4			round, OTTM, buttress
			7.0			OTY
			7.4			round, OTTM, buttress, OTY
			8.6			round, OTTM, OTTГ, buttress, OTY
			10.2;			round, OTTM, OTTГ
			10.2;			round
	127	127.0	5.6			round, OTTM, buttress, OTY
			6.4*; 7.5*			OTY
			7.0			round, OTTM, OTTГ, buttress
			9.2			round, OTTM, OTTГ
			10.2			round, OTTM, OTY
	140	139.7	6.2*;			round, OTTM, buttress, OTY
			7.0*; 7.7*			round, OTTM, buttress, OTY

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-161-204-2002 Steel casing, cold-resistant, and couplings thereto for gas and gas-condensate fields	140	139.7	9.2*;			round, OTTM, OTTG, buttress OTY
			10.5			round, OTTM, OTTG, buttress
	146	146.1	6.5*; 7.0*; 7.7*;			round, OTTM, buttress, OTY
			8.5*; 9.5*; 10.7			round, OTTM, OTTG, buttress, OTY
	168	168.3	7.3*; 8.0*;			round, OTTM, buttress, OTY
			8.9*; 10.6*; 12.1*			round, OTTM, OTTG, buttress, OTY
TU 1321-261-00147016-03 Steel casing, internal-flush, 102, 110 mm in diameter, shouldered within small-size couplings	102	101.6	7.0	to GOST 632-80	Д, К, Е, Л, М	OTTM
	110	110.0				
TU 14-3-514-76 Casing and casing couplings	140	139.7	7.0; 7.7; 9.2; 10.5	9.5-13	Д	round
	146	146.1	6.5; 7.0; 7.7; 8.5; 9.5; 10.7			
TU 14-ZR-82-2005 Casing and casing couplings, cold-resistant for OAO GAZPROM	140	139.7	7.72 - 10.54	6.0-12.0	Д,К,Е,Л,М,Р J55,K55,N80, L80, C95, P110	TMK GF
	168	168.3	8.9 - 12.1			
	178	177.8	8.1 - 15.0			OTTM, OTTG, buttress, TMK TTL-01, TMK FMC, TMK GF
	219	219.1	8.9-14.2			
	244	244.5	8.9-15.9			
	273	273	8.9-16.5			
	324	323.9	9.5-14.0			
TU 14-157-93-2007 Steel seamless casing, H ₂ S-resistant, and couplings thereto, with TMK-FMC enhanced leak resistance thread connection	114	114.3	8.6; 10.2	9.5-11.8	L80C	TMK-FMC
	127	127.0	9.2; 10.7			
	140	139.7	7.0; 7.7; 9.2; 10.5			
	146	146.1	7.0; 7.7; 8.5; 9.5; 10.7			
	168	168.3	8.9; 10.6; 12.1			
	178	177.8	9.2; 10.4; 11.5; 12.7; 13.7; 15.0			
	194	193.7	9.5; 10.9; 12.7; 15.1			
	219	219.1	8.9; 10.2; 11.4; 12.7; 14.2			
TU 14-157-97-2007 Steel seamless casing and cold-resistant couplings thereto with TMK GF enhanced leak resistance thread connection	140	139.7	7.72; 9.17; 10.54	9.5-11.8	L80, J55, K55, N80Q, C95, P110	TMK GF
	168	168.28	7.32; 8.94; 10.59; 12.06			
	178	177.8	8.05; 9.19; 10.36 11.51; 12.65			

Table 1 (continued)

1	2	3	4	5	6	7
TU 14-157-99-2005 Seamless extreme-line steel casing with TMK1 thread connection	102	101.60	5.74; 6.65	10.0-11.3	Д, Е, Л, М, J55, K55, N80, N80Q, L80 Type 1, C95, P110, Q 125 Type 1	TMK1
	114	114.3	6.88; 8.56			
	120	120	6.90; 8.00			
	140	139.7	7.00; 7.70			
Note – * at the initial production stage						

2.2 Mechanical properties of casing manufactured in accordance with GOST 632 are given in Table 2.

Table 2 – Mechanical properties of casing made to GOST 632

Pipe grade	Yield strength, σ_Y		Tensile strength, σ_T	Elongation δ_5 , %, min
	min	max		
Д	379	552	655	14.3
К	490	–	687	12.0
Е	552	758	689	13.0
Л	655	862	758	12.3
М	758	965	862	10.8
Р	930	1137	1000	9.5

2.3 Mechanical properties of casing manufactured in accordance with GOST R 53366-2009 and API Spec 5CT are given in Table 3.

Table 3 – Mechanical properties of casing made to GOST R 53366-2009 and API Spec 5CT

Group	Pipe grade	Type	Total elongation under load, %	Yield strength R_t , MPa		Tensile strength R_m , MPa, min	Hardness, max ^a		Specified wall thickness t , mm	Permissible hardness ^b variation, HRC
				min	max		HRC	HBW		
1	2	3	4	5	6	7	8	9	10	11
1	H40	-	0.5	276	552	414	-	-	-	-
	J55	-	0.5	379	552	517	-	-	-	-
	K55	-	0.5	379	552	655	-	-	-	-
	K72*	-	0.5	491	-	687	-	-	-	-
	N80	1	0.5	552	758	689				-
	N80	Q	0.5	552	758	689	-	-	-	-

Table 3 (continued)

1	2	3	4	5	6	7	8	9	10	11
2	M65	-	0.5	448	586	586	22	235	-	-
	L80	1	0.5	552	655	655	23	241		
	L80	9Cr	0.5	552	655	655	23	241	-	-
	L80	13Cr	0.5	552	655	655	23	241	-	-
	C90	1 & 2	0.5	621	724	689	25.4	255	≤ 12.70	3.0
									12.71 – 19.05	4.0
									19.05 – 25.40	5.0
									≥ 25.40	6.0
	*C95	-	0.5	655	862	758	-	-	-	-
	C95	-	0.5	655	758	724	-	-	-	-
	T95	1 & 2	0.5	655	758	724	25.4	255	≤ 12.70.	3.0
									12.71 – 19.05	4.0
									19.05 – 25.40	5.0
									≥ 25.40	6.0
3	P110	-	0.6	758	965	862	-	-	-	-
4	Q125	1-4	0.65	862	1034	931	b	-	≤ 12.70	3.0
12.71 – 19.05									4.0	
≥ 19.05									5.0	
	Q135*	-	0.65	930	1137	1000	b	-	≤ 12.70	3.0
12.71 – 19.05									4.0	
≥ 19.05									5.0	

^a Laboratory Rockwell C scale test shall be used. as a referee method in cases of disagreement.

^b No hardness limit is specified, but the maximum variation is restricted as manufacturing control.

* if only made to GOST R 53366-2009

3 Marking and Packing

3.1 Marking of Pipe

3.1.1 Tubular goods shall be marked to designate customer-required data on each piece of product.

Products shall be marked either by a combination of stenciling and stamping or by stencilling. Product data shall be given in SI units or USC units.

Marking information applied by stamping or hot rolling and stenciling shall be in accordance with the requirements of product standards/specifications.

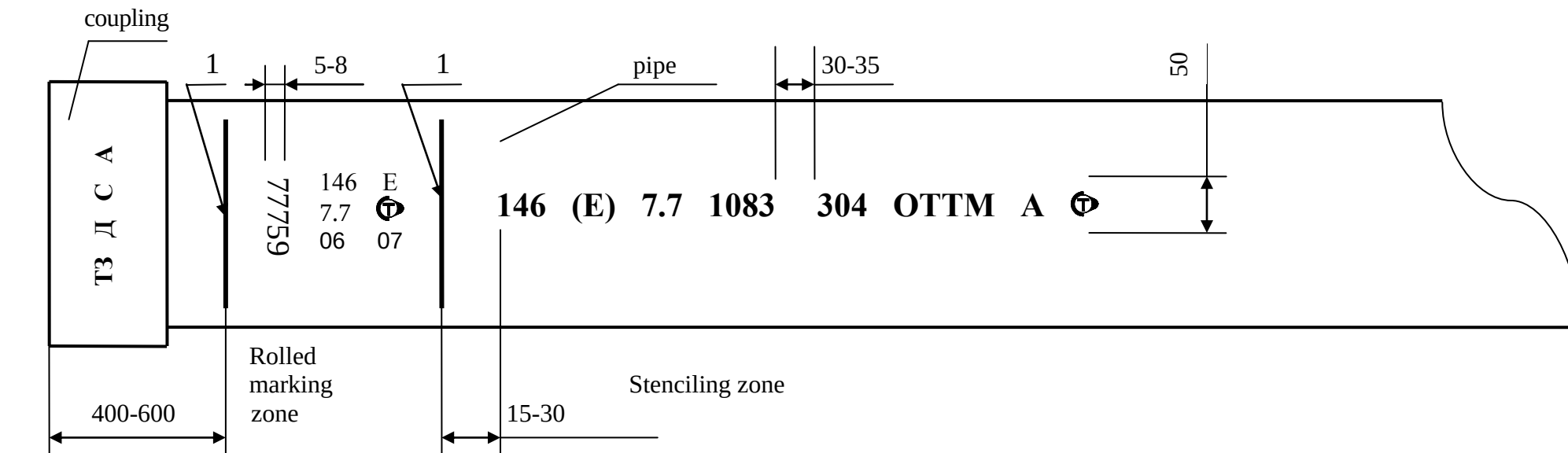
Corrosion-resistant pipe shall be only marked by stenciling; no stamping shall be applied.

Examples of pipe and coupling marking in accordance with GOST 632 and API Spec 5CT are given in Figs 1 – 4.

Fig. 1 shows an example of marking casing and couplings to GOST 632.

Figs 2, 3, 4 show examples of marking casing and couplings to API Spec 5CT.

Pipe made to TU specifications shall be marked in accordance with applicable TU requirements.



Stamped or rolled marking information

- 77759 - pipe No
- 146 - pipe specified diameter, mm
- E - pipe grade
- 7.7 - wall thickness, mm
- Ⓢ - manufacturer's trade mark
- 06 - month of manufacture
- 07 - year of manufacture

Note: 1 – location of rolled marking shall be encircled by light-color paint

Stenciling information

- 146 - pipe specified diameter, mm
- () - ultrasonic examination
- E - pipe grade
- 7.7 - wall thickness, mm
- 1083 - pipe length, cm
- 304 - pipe weight, kg (marked at weight check)
- OTTM - connection type (not marked for pipe with short round thread)
- A - Make (marked when Make A pipe are delivered)
- Ⓢ - manufacturer's trade mark

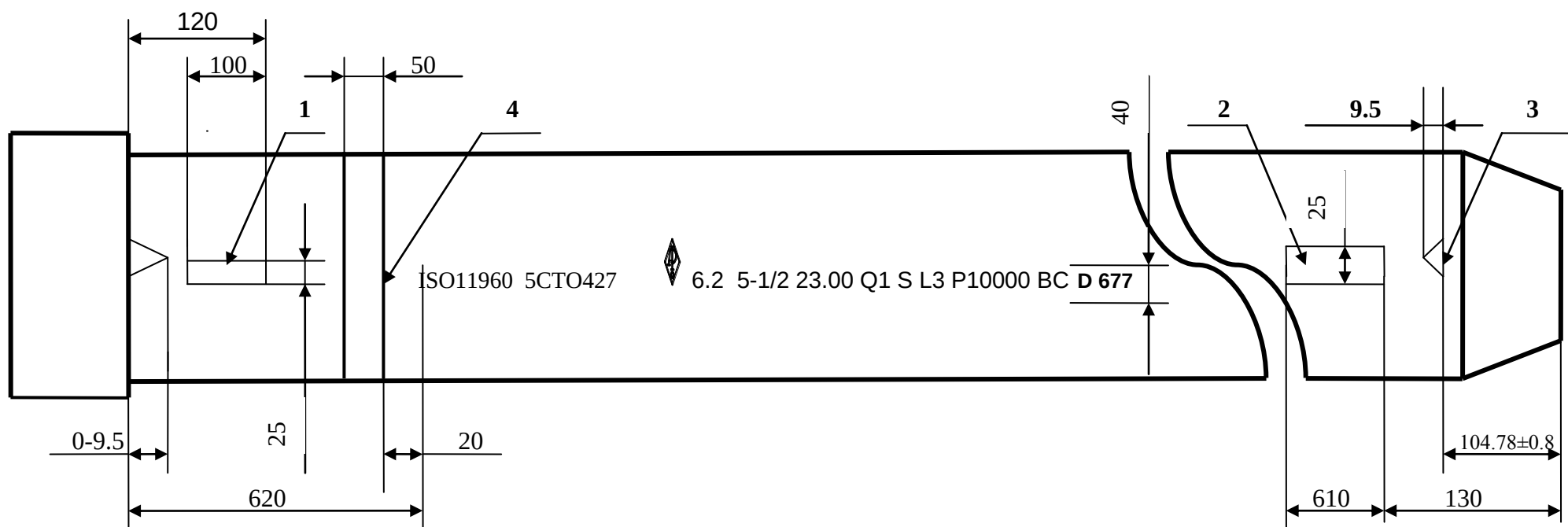
Marking of couplings by stamping

Designation	Information
T3	coupling manufacturer's trade mark
Д	grade
C	special couplings for OTTM and OTTF pipe
A	Make (only for Make A)

Note: marking characters may be applied on the coupling faces

Fig. 1 – Marking example for casing 146 × 7.7 mm, pipe grade "E" with OTTM thread connection to GOST 632

Marking of pipe by stenciling



Pipe stenciling information

ISO11960	- International standard ISO 11960
5CT0427	- License No
	- API Monogram
6	- year of manufacture (the last digit)
2	- quarter of manufacture
5-1/2	- size designation, Label 1 (diameter, inches)
23.00	- weight designation, Label 2 (lb/ft)
Q1	- steel grade Q125, type 1
S	- process of manufacture (seamless pipe)
L3	- product specification level PSL3
P10000	- hydrostatic test pressure (psi)
BC	- buttress thread
D	- standard drift mandrel
677	- unique No of length of pipe

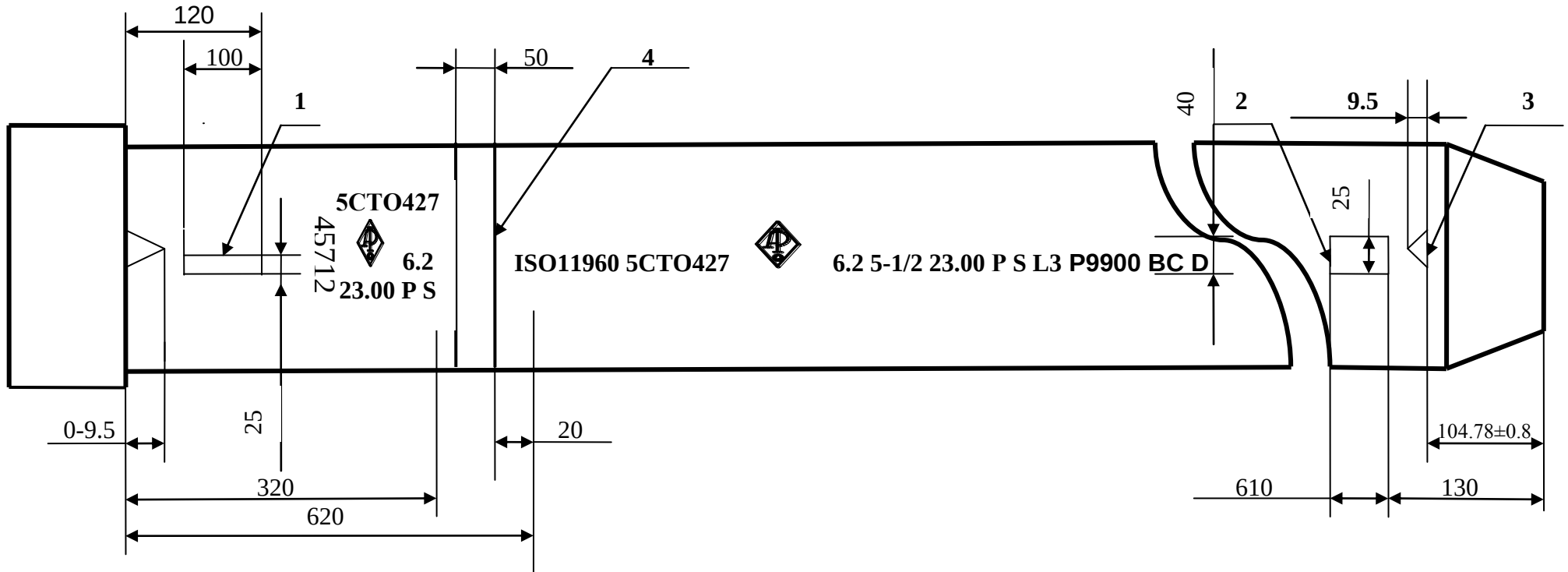
Notes:

1. Paint a band 100 × 25 mm on the pipe mill end against the make-up triangle.
2. Paint a band 610 × 25 mm on the pipe field end against the make-up triangle.
3. Make-up triangle.
4. Orange band: color coding for grade Q125, Type 1.

Fig. 2 – Marking example for pipe with coupling 139.7 × 10.54 mm, grade Q125, Type 1, with buttress thread connection to API Spec 5CT, PSL-3

Marking by stamping

Marking by stenciling



Information of marking by stamping

45712	- No of pipe length
5CT0427	- License No
	- API Monogram
6	- year of manufacture (the last digit)
2	- quarter of manufacture
23.00	- weight designation, Label 2 (lb/ft)
P	- steel grade P110
S	- process of manufacture (seamless pipe)

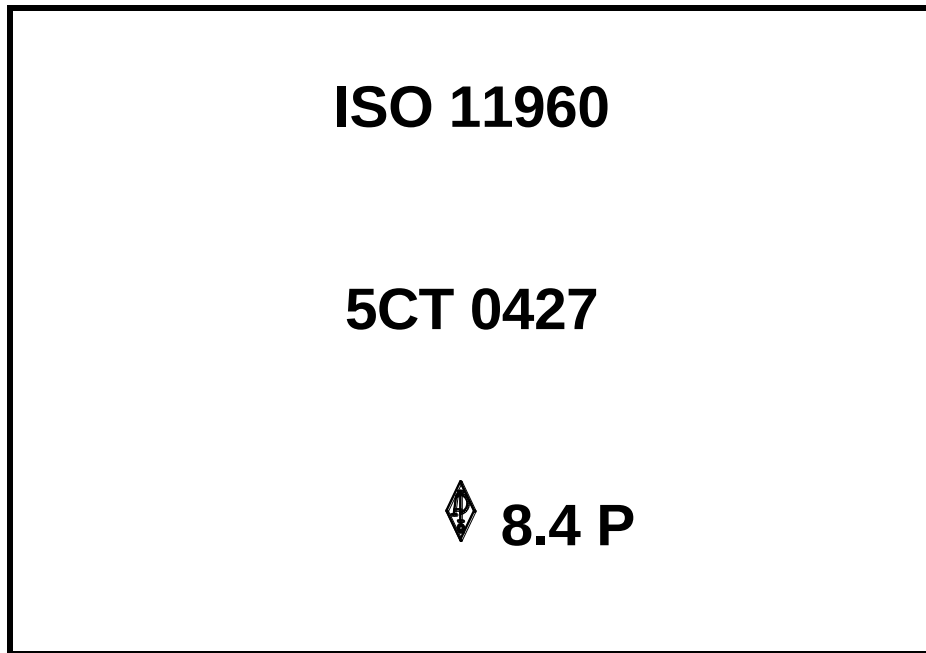
Information of marking by stenciling

ISO11960	- International standard ISO 11960
5CT0427	- License No
	- API Monogram
6	- year of manufacture (the last digit)
2	- quarter of manufacture
5-1/2	- size designation, Label 1 (diameter, inches)
23.00	- weight designation, Label 2 (lb/ft)
P	- steel grade P110
S	- process of manufacture (seamless pipe)
L3	- product specification level PSL3
P9900	- hydrostatic test pressure (psi)
BC	- buttress thread
D	- standard drift mandrel

Notes:

1. Paint a band 100 × 25 mm on the pipe mill end against the make-up triangle.
2. Paint a band 610 × 25 mm on the pipe field end against the make-up triangle.
3. Make-up triangle.
4. White band: color coding for grade P110.

Fig. 3 – Marking example for pipe with coupling 139.7 × 10.54 mm, grade P110, Type 1, with buttress thread connection to API Spec 5CT, PSL-3



Marking information:

ISO11960	- International Standard ISO 11960
5CT0427	- License No
	- API Monogram
8.4	- date of manufacture (last digit of year and number of quarter when the Monogram was applied)
P	- grade P110

Note: the coupling shall be painted in white (color coding for grade P110)

Fig. 4 – Example of marking by stenciling for couplings to casing grade P100 to API Spec 5CT, PSL-1

3.2 Packing of Pipe

3.2.1 Threads, sealing shoulders and sealing bevels of pipe and couplings shall be protected from transportation and/or storage damage by special protectors made of metal, polymer or combined material (metal + polymer). For the requirements applicable to protectors refer to pipe standards/specifications.

3.2.2 Rings shall cover the pipe joint over the length of at least $L - 3$ threads. Nipples shall cover the socket joint over the length of at least $\frac{2}{3} L$.

Rings and nipples shall protrude from the pipe and coupling end faces by at least 10 mm.

3.2.3 The design and material of protectors shall ensure unscrewing thereof, prevent the dust and moisture from ingress in the thread during transportation and handling. The material shall be free from components contributing to corrosion or to the engagement of protectors with a thread.

3.2.4 When screwing-on protective elements, thread connection shoulders and sealing bevels shall be coated with rust-preventive compound. At customer's request, when specified in the purchase order, thread-sealing compound may be used instead of rust-preventive compound.

For the requirements applicable to protectors during packing refer to 3.2.1.

3.2.5 Only pipe of the same pipe lot shall be shipped in a single carload.

Pipe of different pipe lots may be shipped in a single carload, provided the pipe of different lots are segregated, if a pipe lot or a remainder thereof is not consistent with the car capacity.

3.2.5 Pipe shall be delivered in bundles, securely bundled in at least two points.

3.2.6 One bundle shall only contain pipe of the same pipe lot.

3.2.7 Bundling material shall not be used as slinging fixture. The packing shall allow for multiple transfers of bundles with pipe undamaged.

3.2.8 The following pipe packing patterns are used in TMK Company: "extra", "economic", "ordinary" and "simplified". The required pipe packing pattern shall be specified in the purchase order.

3.2.8.1 The above named four packing patterns provide for uniform weight of bundles for all patterns and, accordingly, the same quantity of similar in diameter and wall thickness lengths of pipe per bundle.

To fill the purchase order according to the volume (tonnage, footage) specified by the customer, one to two bundles of the ordered pipe lot, which contain less weight or less lengths of pipe than specified by packing patterns, may be formed.

3.2.8.2 For the "extra" packing pattern, casing shall be bundled so that any contact between pipe bodies, couplings, tool joint elements, upsets be positively precluded. This is achieved by laying pipe on supports. At customer's request, supports are made as external or internal, wooden or metal/polymeric. A support provides a cradle for each length of pipe. Supports filled with pipe shall be bundled with steel band or by stud bracing.

For the requirements applicable to protectors refer to 3.2.1.

Each bundle shall have three tags secured thereto: one tag at the aligned end of the bundle, and another two tags, at the sides of the bundle.

The tag shall contain the following information:

Trade mark and manufacturer	
Consignee	
Station of destination	
Purchase Order No	
Bundle No	
Lot No	
Heat No	

GOST, TU No	
Size	
Steel grade (pipe grade)	
Number of lengths	
Length, m	
Weight, metric tons	
Address and contact phone	

3.2.8.3 For the "economic" packing pattern, casing shall be bundled on external or internal wooden supports.

Threads and pipe ends shall be protected in accordance with 3.2.1.

Each bundle shall have two tags secured thereto: one tag at the aligned end of the bundle, and another tag at the left (of the aligned end) side of the bundle.

3.2.8.4 For the "ordinary" packing pattern, tubing shall be bundled on external or internal wooden supports.

Threads and pipe ends shall be protected in accordance with 3.2.1.

3.2.8.5 For the "simplified" packing pattern, casing shall be packaged in accordance with GOST 10692 requirements and shipped according to the loading patterns accepted at the manufacturer's facility.

The protection of pipe ends and threaded elements shall be in accordance with the requirements of standards/specifications applicable to the manufacture of pipe under shipment.

The protectors shall be fitted on pipe ends, taking into account the geographical area of the destination, e.g., protectors made of cold-resistant plastic where pipe are delivered to areas with low average yearly temperature.

3.2.9 For all types of packing, when forming a bundle of casing, the couplings shall face the same direction.

3.2.10 For the "extra", "economic" and "ordinary" packing patterns, all pipe ends facing one direction shall be coplanar. Misalignment of the opposite pipe ends in the bundle shall not exceed 0.5 m.

3.2.11 Casing shall be packed in bundles using external or internal supports and loaded in a car in accordance with Table 4.

Table 4 – Pattern for loading car with casing

Schedule	Bundle width × height, mm	Total bundle- to-bundle space, mm	Lengths of pipe per bundle	Bundle weight, kg	Bundles in carload, pc.	Carload, metric tons	
1	2	3	4	5	6	7	
114,3×5,2	534×668	150	20	3154	20	63.08	
114,3×8,6				4980	13	64.74	
127,0×5,6	592×592	450		3766	16	60.256	
127,0×9,2			16	4773	13	62.049	
139,7×6,2	640×800	256	20	4592	12	55.104	
139,7×10,5			12	4498	12	53.976	
146,1×6,5	690×863	60	20	5066	12	60.792	
146,1×10,7			12	4808	12	57.696	
168,3×7,3	577×769	514	11	3609	12	43.308	
168,3×12,1	577×577		9	4685	13	60.905	
177,8×5,9	600×800	420	11	3104	12	37.248	
177,8×12,7	600×600		8	4598	14	64.372	
193,7×7,6	664×664	163	9	3575	16	57.20	
193,7×12,7	664×443		6	3815	17	64.855	
219,1×6,7	751×751	563	9	3795	9	34.155	
219,1×14,2	751×501		6	4816	13	62.608	
244,5×7,9	826×826	339	8	4209	9	37.881	
244,5×13,8	826×551		5	4418	14	61.852	
273,1×7,1	909×909	91	8	4214	9	37.926	
273,1×10,2	606×909	394	6	4473	12	53.676	
273,1×16,5	606×606		4	4680	13	60.84	
298,5×8,5	648×972	223	6	4128	12	49.536	
298,5×14,8	648×648		4	4644	13	60.372	
323,9×8,5	710×710	689		3002	12	36.024	
323,9×14,0				4797	12	57.564	
Note – To calculate the carload the casing length is assumed 11 m plus coupling.							

Note – To calculate the carload the casing length is assumed 11 m plus coupling.

4 Good Practice for Pipe Operation – Requirements and Recommendations

4.1 Pipe Pre-operation Requirements

4.1.1 The scope and type of testing for casing delivered by manufacturers shall be determined by the customer in accordance with the geological and technical conditions for drilling.

4.1.2 Casing run-in-hole pre-operation activities shall be carried out at pipe yards (pipe control shops) or on dedicated sites.

4.1.3 The complete scope of casing testing shall include:

- check for availability of the accompanying documents (certificate);
- verification of data contained in certificate for conformity to the marking;
- visual inspection;
- instrument check;
- nondestructive testing;
- drift test;
- hydrostatic test.

4.1.4 In the absence of a certificate of conformity to the requirements of product standards/specifications, the acceptance, pre-operation and use of casing for string assembly is prohibited.

4.1.5 Instrumentation used for pipe quality control shall be certified and verified in accordance with specified procedures.

4.1.6 Each length of casing should be drift-tested along the entire length immediately prior to running. The testing shall be made using drift mandrels conforming to the requirements of GOST 632, GOST R 53366, TU specifications for pipe made to the said GOSTs, and to the requirements of ISO 11960 and API Spec 5CT. During testing make sure that threads, packing and shoulder surfaces of couplings and pipe are properly protected from any damage. Casing that failed to pass the drift test shall be put aside.

4.1.7 For pipe that were repaired at central pipe yards, the yard shall issue an individual certificate indicating the field of application and hole lining limitations.

4.1.8 All casing, both new and reconditioned, shall be always handled with thread protectors in place. Casing shall be placed on supports or on wooden/metal pads freed from stones, sand or mud, other than drill mud.

4.1.9 The customer is free to decrease the number of controlled variables, taking into account the established inspection at manufacturers' facilities and the guarantees of pipe conformity to the requirements of standards and specifications (TU).

However, during transportation and delivery of pipe to the customer, some variables may be brought out of tolerance; therefore, the following shall be retained as required testing:

- visual inspection;
- hydrostatic test;
- drift test;
- failing protectors (lost in transit), gauging.

If, during the hydrostatic test, a pipe thread connection proves leaky, the coupling torquing is allowed. The pipe that has endured the hydrostatic retest shall be considered fit for service.

4.1.10 Immediately prior to running casing remove the protectors from the pipe field end and mill end, thoroughly clean and examine the thread. If even minor thread damages beyond repair are detected, the affected length of pipe shall be put aside.

4.1.11 Rejected pipe shall be stored on the rejected pipe rest racks.

Prior to running in hole, the length of each casing length shall be measured with a steel measuring tape calibrated in millimeters with the least graduation of 3.0 mm.

The length shall be measured from the unengaged coupling face to the power-tight position of coupling face along the pin end of pipe. For round thread connections, OTTM and OTTI connections, such a position shall be the last hairline of the thread; for buttress connection the said position shall be the base of the make-up triangle.

4.2 Casing String Forming

4.2.1 The selection of casing and casing string mechanical design shall be made taking into account the maximum anticipated external and internal pressure on complete displacement of drill mud with formation fluid or liquid-gas mixture, recession of fluid level in the course of well development or artificial lifting, the loads occurring as a result of 3D deflection profile, as well as axial loads applied to the pipe and corrosive properties of fluid at the construction and operation phases.

4.2.2 For the casing string design, standards/specifications approved by Rostekhnadzor shall be used.

4.2.3 A string running procedure shall be developed; such procedure shall provide for properly proportioned stressing of pipe upon cement setting. This is necessary to avoid the occurrence of critical stresses or excessive and/or dangerous tensile stresses during the well operation.

4.2.4 Casing exposed to hydrogen sulfide shall be selected in accordance with the manufacturing process variables and corrosion environment properties.

4.2.5 The conformity of casing to applicable specifications and SSC (sulfide stress cracking) resistance of pipe shall be confirmed by a certificate.

4.2.6 For the mechanical design of casing operating in H₂S-bearing environment, a pressure containment derating factor (K_S) [38] shall be introduced to address this condition.

4.2.7 Thread connections shall be selected in accordance with [39] and Table 5.

4.2.8 Casing string sections shall be formed of commissioned pipe in accordance with the string design.

4.2.9 The pipe length sequence number shall be applied with permanent light paint on the outside diameter close to the field end.

4.2.10 The numbering sequence shall be in accordance with the sequence of running pipe in the hole.

Table 5 – Recommended application of thread connections for casing strings

Gauge pressure, MPa	Thread connection design	Note
Liquid environment, $\gamma \geq 0,3 \times 10^4 \text{ N/m}^3$		
≤ 45	OTTM buttress	Use of round short thread (STC) and long thread (LC) is allowed
	OTTf TMK-TTL-01 TMK CS	
	TMK FMC TMK GF TMK PF	Applicable for H ₂ S-bearing environment
> 45	OTTM and buttress with PTFE ring OTTf TMK-TTL-01 TMK CS	
	TMK FMC TMK GF TMK PF	Applicable for H ₂ S-bearing environment
Gaseous environment, $\gamma \leq 0,3 \times 10^4 \text{ N/m}^3$		
≤ 45	OTTf	
> 45	TMK-TTL-01 TMK CS	
	TMK FMC TMK GF TMK PF	Applicable for H ₂ S-bearing environment

Notes:

- 1) For pipe ≤ 168 mm in diameter at hole deviation rate up to $5^\circ/10$ m and for pipe > 168 mm in diameter at hole deviation rate up to $3^\circ/10$ m, the mechanical design shall be made as for pipe in vertical hole, without regard to any deflection.
- 2) For pipe > 168 mm in diameter at hole deviation rate 3° to $5^\circ/10$ m, the permissible tensile load shall be reduced by 10%, with the exception of TMK GF and TMK PF thread connections.
- 3) At hole deviation rate of $5^\circ/10$ m, use of TMK GF and TMK PF thread connections is recommended.

4.3 Running Casing

4.3.1 Personnel involved in the assembly of casing strings shall be trained and qualified for the operations in question.

4.3.2 When running a combined casing string make sure that the racks accommodating the casing intended for use according to the assembly program are freely accessible.

4.3.3 Make sure that each length of casing be run in strict compliance with the sequence defined at the design phase. Should any length of pipe appear unidentifiable, put it aside until the pipe weight and connection type and size are ascertained.

4.3.4 Prior to makeup of subs and connectors make sure that the mating threaded parts are of the same type and size.

- 4.3.5 Pipe shall be unloaded with mill ends facing the wellhead. Pipe shall be stacked on racks in accordance with the running sequence. Standby lengths of pipe shall be stacked separately, so as to provide free access thereto.
- 4.3.6 Place thread protectors on the field end of the pipe so that the thread will not be damaged while rolling pipe on the rack and pulling into the derrick. Several thread protectors may be cleaned and used repeatedly for this operation. Exercise due care when laying pipe on and rolling pipe to the walkway; use a cable damper, if required. Transfer of pipe to the walkway shall be made impact-free, preventing the pipe from hitting against any part of the derrick or other equipment. When pulling pipe into the derrick, prevent the pipe from any deflection. Exercise special care when operating high-grade casing (grade E and higher) and casing having thread connections packing with PTFE rings and metal-to-metal packing.
- 4.3.7 If a combined string or a string containing unmarked lengths of pipe is to be run, drift each length of pipe with a mandrel to avoid running pipe having excessive weight or insufficient inside diameter.
- 4.3.8 Exercise due care when pulling casing strings into the derrick and lowering; when bracing the slips observe safety precautions to avoid the application of impact loads. Should the string drop down, even a short distance, the lower-end coupling may break out. Make proper arrangements to avoid the setting-down of casing at the lower end or the compression of casing due to other causes, as these may cause pipe to buckle, particularly within the part of the well where the hole enlargement has occurred.
- 4.3.9 After pulling pipe into the derrick and immediately before stabbing, screw protectors off the field end; thereafter, the protectors shall be submitted to UPTO and KO, CBPO or CTB for further delivery to manufacturers.
- 4.3.10 If the protective ring is dirty, check the condition of field end thread. If the thread is dirty or corroded it shall be reconditioned followed by the application of thread-sealing compound.
- 4.3.11 The selection of thread connections and thread-sealing compound by leak resistance criteria should be made in accordance with Table 6, while the application of compound should be made in accordance with 4.5.5.
- 4.3.12 Pipe shall be stabbed in the upright position using, whenever possible, a centralizer. A pin should be stabbed with due care, avoiding any hitting of threaded ends.
- 4.3.13 Make sure that immediately prior to stabbing the pin no dirt finds its way to the thread, and no thread skew occurs due to pin-to-box misalignment.
- 4.3.14 To prevent the thread from skew, pipe should be centralized from a dedicated site located at the level of upper pipe end, or from the derrickman's movable platform.
- 4.3.15 If, after stabbing, the length of pipe is skewed, slightly lift it, pull aside, clean the thread surface from thread compound (sealing compound) or packing material and grind minor imperfections of thread with a smooth-cut file. After the thread is thoroughly cleaned apply thread compound (sealing compound) or packing material. After stabbing rotate the pipe, at first very slowly, to make sure that threads are properly engaged without cross-threading. Casing with threads showing clearly pronounced evidence of damage (distortion) shall be rejected.
- 4.3.16 A thread connection should be made up at first hand-tight (turned home), then with circular tongs. Rotate the pipe slowly (10 rpm, max) to make sure that threads are properly engaged without cross-threading.

4.3.17 If casing has a tendency to wobble unduly at its upper end when making up, indicating that the thread may not be in line with the axis of the casing, the speed of rotation should be decreased to prevent galling of threads.

If wobbling should persist despite reduced rotational speed, the casing should be laid down for inspection. Do not use such casing in a string to be exposed to heavy tensile loads.

4.3.18 After pre-makeup, the thread connections shall be torqued with pipe spanners AKO or AKB (for pipe up to 299 mm in diameter) or with power tongs equipped with a torque gauge. To prevent pipe from crushing make sure that tong dies protrude from the slots by the die cutting height (2 to 3 mm), maximum.

During makeup of casing at the drill site the coupling may slightly rotate in the mill-made connection. This does not indicate insufficient mill screwing of the coupling, but rather confirms that torquing effort reaches the same value as during makeup of the connection at the mill.

4.3.19 Recommended torque values are given in Annex A.3 and Annex A.7 for API Spec 5B thread connections in accordance with ISO 10405 recommendations. Estimated torque values for GOST 632 thread connections are given for nominal standoff at friction coefficient of 0.06.

These values shall be only considered a guide, due to the very wide variations in torque requirements that can exist for a specific connection. Because of this, it is essential that these torque values be related to the average obtained in the course of pipe assembly by linear dimensions.

The torque values listed in Table 1 apply to casing with zinc-plated or phosphate-coated couplings. The listed torque values are not applicable for making up couplings with PTFE rings. When making up round thread connections with PTFE rings, 70 percent of the listed values are recommended. Buttress connections with PTFE seal rings may make up at torque values different from those normally observed on OTTM, OTTG and buttress threads.

4.3.20 To adjust the thread connection makeup torque, it is advisable when starting to run casing from each particular mill shipment to make up sufficient joints to determine the torque necessary to provide optimum makeup, with the power makeup turns (following the hand-tight makeup) recorded.

For power makeup of round thread connections, make approximately three more turns beyond the hand-tight position for pipe 114.3 – 178.8 mm in diameter, and approximately three and a half more turns beyond the hand-tight position for pipe ≥ 193.7 mm in diameter, with the exception of 244.5 mm and 273.1 mm diameters for pipe grade P 110 which have to be made up 4 more threads beyond the hand-tight position.

For pipe with OTTM threads, make at least three and a half more turns beyond the hand-tight position.

These values may indicate that a departure from the values listed in Annex A.3 and Annex A.7 is advisable.

For buttress thread casing connections, makeup torque values should be determined by carefully noting the torque required to make up each of several connections to the base of the triangle.

Then using the torque value thus established, make up the balance of the pipe of that particular weight and grade in the string.

However, for both recommended and adjusted torque values, the minimum torque should be not less than 75 % of the value selected. The maximum torque should be not more than 125 % of the selected torque.

4.3.21 To prevent galling when making up connections in the field, the connections should be made up at a speed not to exceed 25 rpm.

4.3.22 During the makeup, observe both the torque gauge indications and the approximate position of the coupling face with respect to the thread vanish point position for casing with round thread and OTTM thread, and to the base of triangle for casing with buttress thread.

4.3.23 If the torquing proceeds smoothly (no jerking) with gradual increase in torque gauge reading, and the coupling does not get hot (not in excess of 80°C), the makeup process shall be stopped at such torque values as recommended in Annex A.3, Annex A.7 and ISO 10405 or as adjusted in the course of makeups according to 4.3.20.

4.3.24 In the event of jumpwise increase in or stabilization of torque during makeup, and/or in the event of coupling heat buildup in excess of 80°C, the connection shall be broken out, following which a decision shall be made on resolving the causes of disturbance in the makeup process, or on rejection of pipe.

4.3.25 For casing with round thread connection, the coupling end face after the makeup shall be level with the pipe end thread vanish point or shall be short of the thread vanish point by plus/minus two threads (± 6.4 mm).

If, during makeup, the coupling end face is over-turned two threads beyond the thread vanish point and the torque has not reached 75% of the selected value, the connection should be broken out and laid down until re-inspection or repair.

If, during makeup, several threads remain exposed after the torque reaches the selected value, additional torque up to 125% should be applied. If the distance between the coupling end face and the last scratch exceeds two threads with the additional torque attained, this connection should also be considered questionable; it should be broken out and put aside for re-inspection or repair.

4.3.26 For casing with OTTM thread connection, the coupling end face after the makeup shall be level with the pipe end thread vanish point or shall be short of the thread vanish point by 5 mm, maximum.

If, during makeup, the coupling end face has reached the thread vanish point, while the torque has not reached 75% of the average torque value, the connection should be broken out and laid down until re-inspection or repair.

If, during makeup, the coupling end face is under-turned short of the thread vanish point by more than 5 mm, while the torque equals 125% of the average torque value, the connection should be broken out and put aside for re-inspection or repair.

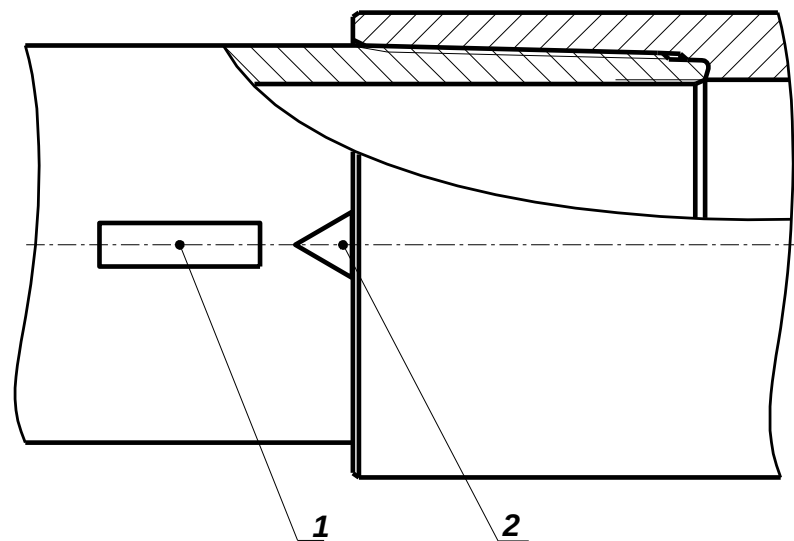
4.3.27 After power makeup of OTTF casing with couplings, the pipe end shall mate the shoulder inside the coupling. The evidence of complete mating of packing surfaces is shown by substantial (steep) growth of makeup torque read by the torque gauge; the makeup shall proceed without jerking, with the makeup torque gradually increasing.

4.3.27.1 To select the makeup torque for casing with OTTF thread connection, caliper the distance between the internal shoulder and outer face of the coupling. Then, machine a tool mark on the mating end of pipe, at a distance as measured between the shoulder and outer face of the coupling. After the

power makeup, the coupling end face shall match the tool mark machined on the pipe field end. During power makeup, when the pipe end reaches the coupling shoulder, the torque steeply increases. Thus recorded torque will present the optimum value for the actual assembly conditions (compound type, pipe sizes, etc.). Further makeup shall be done according to the mean torque value obtained as a result of making up 10 successive lengths of pipe. The rate of power makeup for OTTF thread connections shall not exceed 10 rpm.

4.3.28 For buttress thread casing connections the coupling end face shall be placed at the base of the triangle (optimum torque) or may be one turn of coupling (5.1 mm) lower (minimum torque), or may reach the apex of the triangle (maximum torque) (see Fig. 5).

4.3.29 The position of the triangle for makeup buttress thread pipe and coupling at optimum torque is shown in Fig. 5.



- 1 band 25 × 102 mm applied with light-color paint at the mill end of pipe, opposite the triangle (relative torque)
- 2 makeup triangle

Figure 5 – Position of triangle for makeup at optimum torque

4.3.30 Joints that are questionable as to their proper makeup should be unscrewed and laid down to determine the cause of improper makeup. Both the pipe thread and the mating coupling thread should be inspected. Damaged threads or threads that do not comply with the specification should be repaired. If damaged or out-of-tolerance threads are not found to be the cause of improper makeup, then the makeup torque should be adjusted to obtain proper makeup.

4.3.31 Prior to application of compounds the thread surfaces of pipe and couplings shall be cleaned from dirt and residues of other compounds. Cleaning of threads with kerosene oil and/or diesel fuel is disallowed.

The range and applications of thread compounds are given in Table 6.

4.3.32 Pre-lowering and lowering of casing with thread connections made to specifications (TU) shall be in accordance with the requirements of relevant specifications and OAO TMK Thread Connections Catalog.

4.4 Running Casing Equipment Requirements

4.4.1 For running casing, the bearing surface of the elevator shall be flat and the internal diameter shall be drifted to ensure that casing fits the elevator properly.

4.4.2 For long casing strings, use of slip-type elevators is recommended. Casing spider and elevator slips shall be clean, sharp and shall fit together well. The slips shall be long enough for heavy strings of casing. The spider shall be properly gauged.

4.4.3 For conventional elevator, the bearing surface shall be thoroughly checked for uneven wear which result in deviated lifting of coupling.

4.4.4 Watch carefully that no compound makes its way to working (notch ragged) surfaces of slips contacting the tubing.

Immediately remove the compound in case of any ingress.

4.4.5 The operation of elevator spider with worn, distorted or damaged parts shall be prohibited.

4.4.6 Dimensions of dies and slips shall be consistent with the diameter of pipe to be run.

4.4.7 To obtain the required makeup torque, use pipe tongs equipped with a torque gauge. The tongs size shall be consistent with the pipe size. The tongs shall be properly set against a pipe and the dies shall be perfectly fit to prevent the pipe from crushing and to minimize grooves and dents on the metal surface.

4.4.8 Hydraulic tongs shall be positioned at such distance from the pipe fixing point as to positively prevent the pipe from bending. If required, holding tongs shall be secured under the coupling.

4.5 Thread Compound Selecting Recommendations

4.5.1 For making up connections use compounds listed in standards/specifications, as the compound greatly affects the leak resistance of threads. Thread compounds shall take up high specific pressures, resist high temperatures, seal voids between the mating threads, be easy in application, remain on threaded surfaces for a long time, etc.

4.5.2 The requirements applicable to service performance of thread compounds for casing include the following:

- compatible frictional properties allowing for correct and even makeup;
- adequate lubricating properties allowing to facilitate makeup and breakout of a joint without galling or damaging the mating surfaces of the joint;
- adequate sealing properties for thread connections that will not impair the properties of non-thread connections, i.e., "metal-to-metal" connections, according to service requirements;
- physical and chemical stability, both in service and in storage;
- properties allowing for effective use of the compound on joint mating surfaces under anticipated service conditions and in the anticipated environment.

4.5.3 When evaluating the suitability of thread compound, the customer shall define the conditions, in which the compound will be used and, in addition to the laboratory test data according to compound specifications, shall take into account field test results and field service experience.

4.5.4 Recommended compounds and their respective fields of application are given in Table 6.

Table 6 –Fields of application for thread compounds

Compound	Application
VALMA-API Norm TU 0254-010- 54044229-2009	Making up and sealing thread connections of drill pipe, casing and tubing, including those of cold-resistant and H ₂ S-resistant design. Temperature range: – 50°C to + 200°C.
RUSMA-1 TU 0254-001- 46977243-2002	Sealing of round and buttress threads for connections of casing, tubing, drill pipe and line pipe of any diameter under high-pressure service conditions.
RUS-OLYMP TU 0254-009- 54044229-05	Tool joints for drill pipe of foreign and home manufacture; also, for making up and sealing thread connections of casing and tubing. Temperature range: – 50°C to + 200°C.
RUS-PREMIUM TU 0254-008- 54044229-05	Making up thread connections of casing and tubing with metal-to-metal packing, including gas-tight connections of VAM type and VAGT, SECFR, SPMS2 connections for sour service, harmonized with the former. Can also be used as storage compound. Temperature range: – 50°C to + 200°C.
RUS, RUS-1 TU 0254-005- 54044229-02	Making up and sealing thread connections of casing, tubing and line pipe. Temperature range: – 30°C to + 200°C.
RUS-SNOW QUEEN TU 0254-006- 54044229-02	Making up and sealing thread connections of drill pipe, casing and tubing, including those cold-resistant and corrosion-resistant, and also, of pipelines. Temperature range: – 60°C to + 200°C.
RUSMA R-4 TU 0254-031- 46977243-2004	Sealing and making up thread connections of drill pipe, casing and tubing.
RUSMA R-5 TU 0254-028- 46977243-2004	Inhibited thread compound intended for sealing and corrosion protection of casing and tubing thread connections for downhole and field equipment, operated at NGL fields containing hydrogen sulfide (H ₂ S) and carbon dioxide (CO ₂).
Bestolife API Modified Bestolife	Making up casing, tubing, and line pipe. Prevents surface from abrasion during feeding; water absorption resistant; prevents leakage; resistant to segregation and volume changes; neither solidifies, nor dries, vaporizes or oxidizes. Contains rust prevention agents and H ₂ S inhibitors, which ensures pitting resistance. Complies with or exceeds specifications given in API RP 5A3.
Bestolife 270 ^R Besto- life	Drill collars, drill joints, casing strings, tubing, pipeline joints, bolts, pins, nuts and screws, seals, high-temperature flange connections, pumps, exhaust fans and pipeline connections. Ensures maximum protection and sound sealing for all thread connections (other than oxygen lines). Proprietary formula includes > 60% of metallic lead plus dedicated nonmetallic additions which are applicable in any conditions and resistant to H ₂ S and drilling mud.

4.5.5 Prior to assembly of a working joint the operator shall evenly apply the required quantity of compound on the pin thread and coupling thread so that the entire surface of connected area be coated with the compound. The applicator used for thread-sealing compound shall be free from foreign particles. Before proceeding to application of compound, the thread shall be made clean and dry, and the rust-preventive (storage) compound shall be completely removed. The application shall be done with flat nylon brushes.

4.5.6 Compound of the same type shall be present at a workplace; such compound shall be manufactured to the same specification.

Thread compounds intended for makeup of protectors shall be supplied in original container "as delivered", labeled with the compound description, batch No and date of manufacture. Use of compound from unidentified containers is prohibited. Transfer of compound to another containers is disallowed. Compounds shall be used in a factory-made ready-for-application form; no thinning is permitted.

4.5.7 Service containers with compound shall be covered to prevent the compound from contamination and ingress of foreign material.

The compound to be applied shall be homogenous, of grease consistence, free from solid inclusions (stones, sand, dried mud, chips, etc.).

4.5.8 The compound shall be thoroughly stirred prior to application. Avoid any contact of compound with skin or its ingress in gastrointestinal tract.

4.5.9 The customer shall be responsible for compliance with the environmental requirements within the area of work and for proper selection, use and disposal of thread compound.

4.5.10 Use of machinery oil, diesel oil as substitutes for greases, as well as dry makeup shall be PROHIBITED.

4.6 Monitoring Casing in Service

4.6.1 In operation of casing the following limit loads (without corrosive environment) shall not be exceeded:

- external pressure;
- pressure containment;
- axial tensile load;
- for pipe body:
 - without bending
 - with bending
(Annexes A1, A2 for pipe made to GOST 632 and ISO 10400 recommendations for pipe made to API Spec 5CT);
- for GOST 632 thread connections:
 - with round threads:
 - without bending
 - with bending;
 - with trapezoidal threads (OTTM, OTTT):
 - without bending
 - with bending;
- for makeup torque values (according to Annexes A.3 – A.7).

For thread connections according to specifications (TU):

In accordance with TU requirements and TMK Catalog of API Spec 5B Thread Connections:

- with round threads:
 - without bending
 - with bending;
- for makeup torque values (ISO 10405 recommendations);
- with buttress threads:
 - without bending
 - with bending;
- (ISO 10400 recommendations).

4.6.2 The following variables shall be monitored during operation:

- thread connection makeup torque;
- axial load;
- hole deviation rate;
- environmental pressure (internal, external);
- ambient temperature;
- environment specific gravity;
- environment corrosive agents.

4.7 Care of Casing in Hole

Drill pipe run inside a casing string should be equipped with suitable drill-pipe protectors.

4.8 Recovery of Casing

4.8.1 Breakout tongs should be positioned close to the coupling but not too close since a slight squashing effect where the tong dies contact the pipe surface cannot be avoided. Keeping a space of $\frac{1}{8}$ to $\frac{1}{4}$ of the pipe diameter between the tong and the coupling should normally prevent unnecessary friction in the threads.

4.8.2 Hammering the coupling to facilitate breaking the joint is an injurious practice. If tapping is required, use only the flat face, never the peen face of the hammer, and under no circumstances should a sledge hammer be used. Tap lightly near the middle and completely around the coupling, never near the end nor on the opposite sides only.

4.8.3 Great care should be exercised to disengage all of the thread before lifting the casing out of the coupling. Do not pull abruptly the casing out of the coupling.

4.8.4 All threads should be cleaned and lubricated or should be coated with a material that will minimize corrosion. Clean protectors should be placed on the casing before it is laid down.

4.8.5 When casing is being retrieved because of a casing failure, it is imperative to future prevention of such failures that a thorough metallurgical study be made. Every attempt should be made to retrieve the failed portion in the "as-failed" condition. When thorough metallurgical analysis reveals some facet of pipe quality to be involved in the failure, the results of the study should be recorded.

4.9 Basic Recommendations for Prevention of Emergencies

4.9.1 Before proceeding to construction of wells, a degree of risks of emergency failure for casing strings shall be reviewed. In particular, such risks may be caused by severe service conditions (low temperatures, corrosive environment, etc.). If required, mitigation arrangements shall be developed.

4.9.2 Strictly comply with the provisions of Section 4 "Good Practice for Operation of Pipe" of this Manual, API RP 5C1 and ISO 10405, considering these preventive arrangements for mitigation of risks of emergency failure for casing strings used in construction of wells.

4.9.3 To reduce the emergencies during the works for casing of wells:

- have a good knowledge of mining and geological conditions of well construction, range of potential problems;
- strictly comply with the requirements of detailed design, current procedural regulations and safety codes applicable to petroleum and natural gas industry, process flow diagram statement, works programs; have the above listed documents available at the drill site;
- monitor the condition of borehole and serviceability of equipment and tools;
- know and observe operating procedures for pipe and equipment;
- monitor applied loads;
- make up connections with tongs equipped with a torque gauge;
- implement, in full and in timely manner, arrangements for fault-free working at the drill site;
- make sure that the requirements of Section 4 "Good Practice for Operation of Pipe" of this Manual are complied with;

- loads applied to casing in operation shall not exceed the limit loads according to Annex A, specification (TU) requirements, recommendations given in "Thread Connections Catalog" (TMK publication), and ISO 10405, for pipe made to API Spec 5CT with safety factors applied.

To avoid emergencies, running of casing shall be prohibited:

- if the factory marking data are inconsistent with the values stated in the certificate;
- if the inspection results in detection of defects of a magnitude that is greater than allowable;
- in case of improper seating of coupling at the mill (standoff not in conformity with specification requirements, explicit pipe-to-coupling misalignment, etc.);
- when the pipe wall thickness including the wall thickness at the threaded end in the face-end plane, is not in compliance with the specification requirements;
- if hydrostatic testing reveals pipe or thread connection leakage.

Investigations of industrial accidents involving pipe should be conducted in accordance with "Guidelines for investigation of industrial accidents with drill pipe, casing and tubing, and for claim documenting".

5 Transportation and Storage

5.1 Transportation

5.1.1 Transportation of pipe shall be carried out by rail (on open-top freight cars), by truck or by water in accordance with Shipping Rules and Specifications for Cargo Loading and Fastening applicable to the specific means of transportation.

5.1.2 Stringers shall be provided across the car or truck body bottom. Pipe bundles shall be provided with transportation straps.

5.1.3 When carrying pipe on flat wagon, upright posts, wire-tied above the pipe, shall be installed on the car sides.

5.1.4 For truck transportation, the following precautions shall be taken:

- load pipe on bolsters and tie down with suitable chain at the bolsters;
- load pipe with all couplings facing the same end of the truck.

5.1.5 The bundle weight shall not exceed 5 metric tons, or, at customer's request, 3 metric tons. When bundling pipe, couplings screwed on pipe shall face the same direction.

5.1.6 Bundling material shall not be used as slinging fixture. The packing shall allow for multiple transfers of bundles with pipe undamaged.

5.2 Storage

5.2.1 All casing stored at a pipe yard shall rest on racks.

5.2.2 The following categories of pipe shall be stored on individual racks:

- a) new pipe received from manufacturers;
- b) pipe sorted out by type of reconditioning;
- c) reconditioned pipe;

- d) rejected pipe beyond repair;
- e) pipe grouped in sets for forming strings and prepared for delivery to the customer.

5.2.3 Each rack shall accommodate the pipe of the same characteristics: type, nominal diameter, wall thickness, grade.

5.2.4 The following requirements apply to the racks and the pipe laying:

- a) the rack bearing surface shall be horizontal to avoid any inadvertent rolling of pipe; the rack design shall ensure that the pipe rest on the rack at least at three points of contact, to avoid any inadvertent rolling down; each rack shall be provided with upright posts;
- b) the rack bearing surface should be no less than 500 mm above the ground;
- c) pipe should not be stacked higher than 3000 mm;
- d) provide wooden strips as separators between successive layers of pipe. Use at least three spacing strips, 35 – 40 mm thick each.

The strips between layers of pipe shall be coplanar.

5.2.5 Each rack shall be provided with a nameplate containing the specifications of accommodated pipe.

5.2.6 Threads shall be coated by rust-preventive compound and covered with thread protectors.

5.2.7 Storage of acids, alkalis and other corrosive chemicals close to the racks shall be forbidden.

6 Safety Requirements

To ensure safe operation of pipe, make sure that the requirements of the manufacturer's Operation Manual for the delivered product and other Manufacturer's recommendations, as well as combined corporate regulations for operation of pipe, duly approved at drilling facilities and consistent with the Manufacturer's Operation Manual and PB 08-624-03 "Petroleum and Natural Gas Industry Safety Code" are unconditionally complied with.

7 Manufacturer's Guarantee

The Manufacturer warrants that the pipe and couplings are and remain in conformity to specification requirements within the period specified in the contract (purchase order), provided the pipe operation and storage procedures are complied with.

Annex A

Strength Properties and Makeup Torque Values for Casing Made to GOST 632

Table A.1 – Strength properties of pipe body for GOST 632 pipe

Nominal diameter, mm	Wall thickness, mm	External pressure limit, MPa					Internal pressure limit, MPa						Limit tensile loads, kN					
		Д	Е	Л	М	Р	Д	К	Е	Л	М	Р	Д	К	Е	Л	М	Р
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
114	5.2	20.3	-	-	-	-	30.2	-	-	-	-	-	666	-	-	-	-	-
	5.7	24.2	-	-	-	-	33.1	-	-	-	-	-	744	-	-	-	-	-
	6.4	29.5	38.6	42.7	45.9	-	37.2 (36.5)	- (48.0)	54.0	64.2	74.3	-	824 (804)	(1058)	1196	1412	1646	-
	7.4	36.9	50.3	57.1	62.7	70.1	42.9 (42.3)	(55.5)	62.4	74.2	85.9	105.4	940 (920)	(1216)	1372	1628	1882	2314
	8.6	45.3	63.4	73.4	82.4	95.5	50.0 (49.0)	(64.5)	72.5	86.3	99.8	122.5	1078 (1058)	(1392)	1568	1862	2156	2646
	10.2	-	-	93.7	106.9	127.4	-	-	-	102.3	118.3	145.3	-	-	-	2176	2530	3098
127	5.6	19.0	-	-	-	-	29.3	-	-	-	-	-	804	-	-	-	-	-
	6.4	24.6	31.1	33.6	35.5	-	33.4 (32.8)	(43.2)	48.6	57.7	66.9	-	920 (902)	(1176)	1332	1588	1842	-
	7.5	32.2	42.7	47.7	51.7	56.6	39.2 (38.5)	(50.7)	57.0	67.6	78.3	96.2	1056 (1038)	(1372)	1548	1842	2138	2608
	9.2	43.0	60.0	69.2	77.4	88.8	48.1 (47.3)	(62.2)	69.8	83.0	96.1	117.9	1294 (1274)	(1666)	1882	2236	2568	3156
	10.7	52.3	74.1	86.7	98.3	116.4	56.0	-	81.3	96.6	111.8	137.2	1490	-	2156	2548	2960	3628
140	6.2	19.3	-	-	-	-	29.5 (28.9)	(38.0)	42.7	-	-	-	980 (960)	(1274)	1430	-	-	-
	7.0	24.4	30.7	33.2	35.0	-	33.2 (32.6)	(42.9)	48.3	57.4	66.5	-	1098 (1078)	(1430)	1608	1902	2216	-
	7.7	28.8	37.4	41.3	44.2	47.6	36.6 (36.0)	(47.3)	53.1	63.1	73.1	89.7	1216 (1196)	(1568)	1764	2078	2412	2960
	9.2	37.7	51.7	58.8	64.9	72.8	43.7 (42.9)	(56.5)	63.5	75.5	87.4	107.3	1430 (1412)	(1842)	2078	2470	2862	3510
	10.5	45.2	63.3	73.3	82.4	95.3	49.9 (49.0)	(64.5)	72.4	86.2	99.7	122.4	1608 (1588)	(2078)	2352	2784	3236	3962
146	6.5	19.4	-	-	-	-	29.5 (29.0)	(38.1)	42.9	-	-	-	1078 (1058)	(1392)	1568	-	-	-
	7.0	22.4	27.7	29.8	31.3	-	31.8 (31.3)	(41.1)	46.2	63.5	54.9	-	1156 (1136)	(1490)	1686	2000	2314	-
	7.7	26.7	34.2	37.4	39.7	-	35.0 (34.3)	(45.2)	50.8	60.4	69.9	-	1274 (1254)	(1646)	1842	2196	2530	-
	8.5	31.4	41.6	46.3	50.0	54.5	38.6 (37.9)	(49.9)	56.1	66.7	77.2	94.7	1392 (1372)	(1804)	2020	2412	2784	3412
	9.5	37.1	50.7	57.5	63.2	70.8	43.1 (42.4)	(55.8)	62.7	74.5	86.3	105.9	1548 (1510)	(2000)	2234	2666	3078	3784
	10.7	43.7	61.0	70.4	78.8	90.7	48.6 (47.7)	(62.8)	70.6	83.9	97.2	119.2	1726 (1686)	(2234)	2510	2980	3452	4236

Table A.1 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
168	7.3	18.3	21.9	-	-	-	28.8 (28.8)	(37.3)	41.9	49.7	-	-	1392 (1372)	(1804)	2040	2412	-	-
	8.0	22.1	27.3	-	-	-	31.6 (31.0)	(40.8)	45.8	54.4	-	-	1510 (1490)	(1962)	2216	2628	-	-
	8.9	26.9	34.4	37.6	40.0	42.8	35.1 (34.5)	(45.4)	51.0	60.6	70.1	86.1	1686 (1666)	(2176)	2450	2922	3372	4138
	10.6	35.4	47.9	54.2	59.3	65.9	41.9 (41.1)	(54.0)	60.7	72.2	83.5	102.5	1980 (1960)	(2568)	2882	3432	3980	4884
	12.1	42.6	59.3	68.3	76.3	87.4	47.7 (46.9)	(61.7)	69.3	82.4	95.4	117.1	2254 (2216)	(2902)	3274		4490	5510
178	5.9	9.8	-	-	-	-	22.1	-	-	-	-	-	1216	-	-	-	-	-
	6.9	14.4	-	-	-	-	25.8 (25.3)	(33.3)	37.4	-	-	-	1412 (1372)	(1804)	2038	-	-	-
	8.1	20.3	24.6	26.3	-	-	30.3 (29.7)	(39.1)	43.9	52.3	-	-	1626 (1608)	(2118)	2372	2824	-	-
	9.2	25.9	32.8	35.8	37.9	40.4	34.3 (33.4)	(44.4)	49.9	59.3	68.6	84.2	1842 (1824)	(2392)	2686	3196	3686	4530
	10.4	31.7	42.1	46.9	50.6	55.2	38.8 (38.1)	(50.2)	56.4	67.1	77.5	95.2	2078 (2038)	(2686)	3020	3568	4138	5080
	11.5	36.9	50.2	57.0	62.6	69.9	42.9 (42.2)	(55.5)	62.4	74.1	85.8	105.3	2274 (2234)	(2942)	3314	3922	4550	5588
	12.7	42.3	58.7	67.6	75.4	86.4	47.4 (46.6)	(61.3)	68.8	81.9	94.7	116.3	2490 (2450)	(3216)	3628	4314	4980	6118
	13.7	-	65.6	76.2	85.8	99.8	-	-	74.3	88.3	102.2	125.5	-	-	3882	4628	5354	6570
194	15.0	-	-	86.9	98.5	116.6	-	-	-	96.7	111.9	137.4	-	-	-	4980	5766	7100
	7.6	14.7	-	-	-	-	26.1 (25.6)	(33.6)	37.8	-	-	-	1686 (1646)	(2176)	2450	-	-	-
	8.3	17.9	21.3	22.4	23.2	24.2	28.4 (27.9)	(36.8)	41.3	49.1	56.9	69.8	1824 (1804)	(2372)	2666	3156	3666	4490
	9.5	23.4	29.2	31.6	33.1	35.1	32.5 (32.0)	(42.1)	47.3	56.2	65.0	79.9	2078 (2038)	(2686)	3020	3588	4158	5118
	10.9	29.8	39.0	43.1	46.4	50.2	37.4 (36.7)	(48.2)	54.2	64.5	74.6	91.7	2372 (2334)	(3058)	3452	4098	4746	5824
	12.7	37.5	51.4	58.3	64.3	72.1	43.5 (42.4)	(56.3)	63.2	75.1	87.0	106.8	2744 (2686)	(3530)	3980	4726	5472	6706
219	15.1	-	-	77.4	87.4	101.9	-	-	-	89.3	103.4	127.0	-	-	-	5550	6412	7884
	6.7	7.9	-	-	-	-	20.3	-	-	-	-	-	1686	-	-	-	-	-
	7.7	11.4	-	-	-	-	23.3 (22.9)	(30.2)	33.9	-	-	-	1940 (1902)	(2510)	2824	-	-	-
	8.9	16.0	18.5	19.5	20.1	-	27.0 (26.5)	(34.8)	39.2	46.6	53.8	-	2234 (2196)	(2196)	2882	3236	4452	-
	10.2	21.2	26.0	27.7	29.0	30.5	30.9 (30.4)	(39.9)	44.9	53.3	61.8	75.8	2530 (2490)	(3274)	3686	4372	5060	6216
	11.4	26.1	33.2	36.3	38.4	41.0	34.5 (33.9)	(44.6)	50.2	59.6	69.0	84.7	2824 (2764)	(3648)	4098	4864	5628	6922
	12.7	31.2	41.3	46.0	49.6	54.0	38.5 (37.7)	(49.7)	55.9	66.5	76.9	94.4	3118 (3058)	(4040)	4530	5392	6236	7648
	14.2	-	50.4	57.2	62.8	70.3	43.1 (42.3)	(55.6)	62.4	74.3	86.0	105.5	3470 (3392)	(4470)	5040	5982	6922	8492

Table A.1 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
245	7.9	9.2	-	-	-	-	21.5 (21.1)	(27.7)	31.2	-	-	-	2216 (2176)	(2882)	3236	-	-	-
	8.9	12.4	13.9	14.5	14.8	-	24.2 (23.7)	(31.3)	35.1	41.8	48.2	-	2490 (2450)	(3236)	3628	4314	4980	-
	10.0	16.2	18.9	19.8	20.5	21.3	27.2 (26.7)	(35.1)	39.4	46.9	54.2	66.6	2784 (2744)	(3608)	4060	4824	5570	6844
	11.1	20.2	24.4	26.1	27.2	28.4	30.1 (29.6)	(38.9)	43.7	52.1	60.2	73.9	3078 (3020)	(3980)	4470	5334	6158	7570
	12.0	23.4	29.3	31.6	33.2	35.1	32.5 (32.0)	(42.1)	47.4	56.3	65.1	79.9	3314 (3254)	(4294)	4824	5746	6628	8158
	13.8	29.9	39.2	43.4	46.7	50.6	37.4 (36.8)	(48.4)	54.4	64.7	74.9	91.9	3784 (3726)	(4902)	5510	6550	7570	9296
273	15.9	-	-	57.5	63.2	70.8	-	-	-	74.5	86.3	105.9	-	-	-	7472	8648	10610
	7.1	5.1	-	-	-	-	17.3 (17.0)	(22.3)	25.1	-	-	-	2254 (2216)	(2902)	3274	-	-	-
	8.9	9.4	10.3	10.6	10.9	-	21.7 (21.3)	(27.9)	31.5	37.4	43.2	-	2804 (2744)	(3608)	4060	4844	5584	-
	10.2	13.1	14.9	15.5	16.0	16.5	17.3 (17.0)	(22.3)	25.1	-	-	-	3169 (3138)	(4118)	4648	5510	6374	7924
	11.4	17.0	19.9	21.0	21.7	22.5	24.8 (24.3)	(32.1)	36.0	42.8	49.5	60.8	3350 (3490)	(4588)	5158	6138	7100	8708
	12.6	20.9	25.4	27.2	28.3	29.7	27.7 (27.3)	(35.8)	40.3	47.8	55.4	67.9	3902 (3844)	(5060)	5688	6746	7806	9590
	13.8	24.8	31.3	33.8	35.8	37.9	30.6 (30.1)	(39.6)	44.5	52.2	61.2	75.1	4256 (4176)	(5510)	6198	7354	8512	10454
299	15.1	-	37.6	41.6	44.5	48.0	33.5 (32.9)	(43.3)	48.7	57.9	97.1	82.3	-	-	6746	8002	9276	11376
	16.5	-	-	50.0	54.3	59.7	-	-	53.3	63.3	73.3	90.0	-	-	-	8708	10008	12376
	8.5	6.6	-	-	-	-	18.9 (18.5)	(24.4)	27.4	-	-	-	2942 (2882)	(3784)	4256	-	-	-
	9.5	8.8	-	-	-	-	21.2 (20.8)	(27.3)	30.7	36.5	42.3	51.9	3274 (3216)	(4216)	4746	5648	6530	8022
	11.1	13.0	14.7	15.4	15.8	-	24.7 (24.2)	(31.9)	35.9	42.6	49.3	60.6	3804 (3726)	(4926)	5510	6550	7590	9316
324	12.4	16.8	19.6	20.7	21.4	22.3	27.5 (27.1)	(35.0)	40.1	47.6	55.1	67.6	4216 (4158)	(5452)	6138	7296	8434	10356
	14.8	-	30.0	32.4	34.1	36.1	32.9 (32.4)	(42.5)	47.8	56.9	65.8	80.7	5000 (4902)	(6472)	7256	8630	9982	12258
	8.5	5.3	-	-	-	-	17.4	-	-	-	-	-	3196	-	-	-	-	-
	9.5	7.2	7.6	7.8	-	-	19.5 (19.1)	(25.2)	28.2	-	-	-	3550 (3490)	(4588)	5158	-	-	-
	11.0	10.4	11.6	12.0	12.3	-	22.5 (22.2)	(29.1)	32.7	38.9	45.0	55.3	4098 (4020)	(5294)	5962	7080	8198	10060
	12.4	13.9	15.9	16.6	17.1	17.6	25.4 (25.0)	(32.8)	37.0	43.9	50.8	62.4	4608 (4510)	(5942)	6688	7942	9198	11278
	14.0	18.2	21.7	22.9	23.8	24.8	28.7 (28.1)	(37.1)	41.7	49.5	57.4	70.4	5178 (5080)	(6668)	7512	8924	10316	12670

Table A.1 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
340	8.4	4.5	-	-	-	-	16.4	-	-	-	-	-	3314	-	-	-	-	-
	9.7	6.7	7.2	7.3	-	-	18.9 (18.6)	(24.5)	27.5	32.7	-	-	3804 (3746)	(4922)	5530	6590	-	-
	10.9	9.0	9.9	10.2	-	-	21.3 (20.9)	(27.5)	31.0	36.8	-	-	4274 (4196)	(5510)	6198	7374	-	-
	12.2	12.0	13.4	13.9	14.3	-	23.8 (23.3)	(30.8)	34.6	41.2	47.6	-	4766 (4668)	(6158)	6904	8218	9512	-
	13.1	14.1	16.3	17.0	17.4	18.0	25.6 (25.1)	(33.0)	37.2	44.2	51.2	62.7	5098 (5000)	(6590)	7394	8806	10178	12494
	14.0	16.5	19.2	20.3	21.0	21.8	27.4 (26.9)	(35.4)	39.7	47.3	54.7	67.1	5432 (5334)	(7020)	7884	9374	10846	13316
	15.4	20.1	24.3	26.0	-	-	16.4	-	-	-	-	-	-	-	-	10276	11886	14592
Note – Strength property values in parentheses only apply to pipe of Make B; values without parentheses apply to pipe of both Make A and B.																		

Table A.2 – Strength derating factors for plain pipe body at bending (λ)

Pipe diameter, mm	Pipe grade					
	Д	К	Е	Л	М	Р
114.3	0.028	0.021	0.019	0.016	0.014	0.011
127.0	0.031	0.023	0.021	0.018	0.016	0.012
139.7	0.034	0.026	0.023	0.020	0.017	0.013
146.1	0.035	0.027	0.024	0.021	0.018	0.014
168.3	0.041	0.031	0.028	0.024	0.021	0.016
177.8	0.043	0.033	0.030	0.025	0.022	0.017
193.7	0.047	0.036	0.032	0.027	0.024	0.019
219.1	0.053	0.040	0.036	0.031	0.027	0.021
244.5	0.059	0.045	0.041	0.034	0.030	0.024
273.1	0.066	0.050	0.046	0.038	0.033	0.026
298.5	0.072	0.055	0.050	0.042	0.036	0.029
323.9	0.078	0.059	0.054	0.046	0.040	0.031
339.7	0.082	0.062	0.057	0.048	0.042	
Note: $n' = \frac{n}{1 - n \lambda (\alpha_0 - 0,5)}$, where n', n – tensile strength safety factor with and without bending, respectively; α_0 – pipe deviation rate.						

Table A.3 – Limit tensile loads and approximate makeup torque values for GOST 632 round thread connections

Pipe specified diameter (mm)	Wall thickness (mm)	Limit tensile loads for casing with short round thread connections (STC) (kN)						Limit tensile loads for casing with long round thread connections (LC) (kN)						Makeup torque values for casing with STC thread connections (N·m)						Makeup torque values for casing with LC thread connections (N·m)					
		Д	К	Е	Л	М	Р	Д	К	Е	Л	М	Р	Д	К	Е	Л	М	Р	Д	К	Е	Л	М	Р
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
114	5.2	343	-	-	-	-	-	-	-	-	-	-	-	1460	1679	1777	1929	2084	2315	-	-	-	-	-	-
	5.7	421	-	-	-	-	-	-	-	-	-	-	-	2080	2384	2523	2739	2958	3286	-	-	-	-	-	-
	6.4	490 (480)	(627)	706	-	-	-	500	-	725	863	1000	-	2290	2628	2781	3019	3261	3622	2279	2614	2767	3004	3244	3603
	7.4	(578)	(755)	853	-	-	-	598 (588)	(774)	872	1039	1206	1480	3347	3839	4063	4411	4764	5292	3068	3520	3725	4044	4368	4852
	8.6	(696)	(912)	1019	1216	1412	1726	725 (706)	(931)	1049	1245	1441	1775	3702	4247	4494	4879	5270	5854	3719	4266	4515	4901	5294	5880
	10.2	-	-	-	-	-	-	-	-	-	1520	1755	2157	-	-	-	-	-	-	4129	4736	5012	5441	5877	6528
127	5.6	441	-	-	-	-	-	-	-	-	-	-	-	2100	2409	2550	2768	2990	3321	-	-	-	-	-	-
	6.4	539 (529)	(706)	784	-	-	-	558	-	823	970	1127	-	2652	3042	3219	3495	3775	4193	2642	3030	3207	3481	3760	4177
	7.5	666 (675)	(836)	970	1147	-	-	686 (676)	(892)	1000	1196	1382	1696	3122	3581	3790	4114	4444	4936	3329	3818	4041	4387	4738	5263
	9.2	(833)	(1098)	1235	1461	1696	2079	882 (863)	(1137)	1284	1520	1765	2167	4278	4907	5193	5638	6090	6764	4604	5281	5589	6068	6554	7280
	10.7	-	-	-	-	-	-	1049	-	1520	1804	2088	2569	-	-	-	-	-	-	5068	5813	6152	6679	7214	8013
140	6.2	568 (558)	(735)	833	-	-	-	-	-	-	-	-	-	2523	2894	3063	3325	3592	3990	-	-	-	-	-	-
	7.0	666 (657)	(863)	970	-	-	-	696 (686)	(902)	1010	1206	1392	-	2920	3349	3544	3848	4156	4616	3090	3544	3751	4072	4398	4885
	7.7	755 (745)	(970)	1098	1304	1510	1853	784 (774)	(1010)	1137	1353	1569	1922	3277	3759	3978	4319	4665	5181	3487	4000	4234	4596	4964	5514
	9.2	(912)	(1206)	1353	1608	1863	2294	970 (951)	(1255)	1412	1676	1941	2383	4444	5097	5395	5857	6326	7026	4769	5470	5789	6285	6789	7540
	10.5	(1068)	(1402)	1578	1873	2167	2667	1127 (1108)	(1461)	1637	1951	2255	2775	4815	5523	5845	6346	6854	7614	5193	5957	6304	6844	7392	8211
146	6.5	637 (627)	(823)	931	-	-	-	-	-	-	-	-	-	2999	3440	3641	3952	4269	4742	-	-	-	-	-	-
	7.0	706 (696)	(912)	1019	-	-	-	735 (725)	(951)	1068	1265	1461	-	3212	3684	3899	4232	4572	5078	3442	3949	4176	4537	4900	5443
	7.7	794 (774)	(1019)	1147	-	-	-	823 (813)	(1068)	1196	1431	1657	-	3806	4366	4620	5016	5418	6018	3765	4319	4570	4962	5359	5953
	8.5	(872)	(1157)	1294	1539	1784	2196	931 (912)	(1206)	1353	1608	1863	2285	4947	5675	6006	6520	7042	7822	5372	6162	6521	7079	7646	8493
	9.5	(1000)	(1314)	1480	1755	2030	2500	1059 (1039)	(1372)	1539	1833	2128	2608	5378	6169	6529	7088	7656	8503	5873	6737	7130	7740	8360	9286
	10.7	(1147)	(1510)	1696	2010	2324	2863	1216 (1196)	(1569)	1765	2098	2432	2981	6812	7814	8269	8977	9697	10771	7478	8578	9078	9855	10645	11824
168	7.3	834 (833)	(1098)	1235	1461	-	-	882	-	1284	-	-	-	3465	3974	4206	4566	4932	5478	3687	4229	4476	4859	5248	5829
	8.0	931 (951)	(1226)	1373	1638	-	-	-	-	-	-	-	-	3744	4295	4545	4935	5330	5920	4009	4599	4867	5284	5707	6340
	8.9	1078 (1059)	(1392)	1569	1863	2157	2647	1127 (1108)	(1461)	1637	1951	2255	2765	4480	5139	5438	5904	6377	7083	5745	6589	6974	7571	8177	9083
	10.6	(1294)	(1706)	1922	2285	2638	3246	1382 (1353)	(1784)	2010	2383	2765	3393	6038	6926	7330	7957	8595	9547	6560	7524	7963	8645	9338	10372
	12.1	(1500)	(1981)	2226	2538	3059	3756	1598 (1569)	(2069)	2324	2765	3197	3932	7663	8790	9303	10099	10909	12117	8367	9597	10157	11027	11910	13229

Table A.3 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
178	5.9	617	-	-	-	-	-	-	-	-	-	-	-	2106	2415	2556	2775	2998	3330	-	-	-	-	-	-
	6.9	823 (813)	(1068)	1206	-	-	-	-	-	-	-	-	-	3484	3997	4230	4592	4960	5509	-	-	-	-	-	-
	8.1	1010 (990)	(1304)	1471	1745	-	-	1068 (1049)	(1372)	1549	1833	-	-	4337	4975	5265	5716	6174	6858	4801	5507	5828	6327	6834	7591
	9.2	1176 (1157)	(1520)	1706	2030	2353	2883	1235 (1216)	(1598)	1804	2137	2481	3040	5196	5961	6308	6848	7397	8216	5800	6653	7041	7644	8256	9171
	10.4	(1333)	(1755)	1971	2343	2706	3324	1431 (1402)	(1843)	2079	2471	2853	3510	5641	6470	6848	7434	8030	8919	6338	7270	7694	8353	9022	10021
	11.5	(1490)	(1961)	2206	2618	3030	3726	1598 (1569)	(2069)	2324	2765	3197	3922	6000	6883	7284	7908	8542	9488	6773	7769	8222	8926	9641	10709
	12.7	(1667)	(2186)	2461	2922	3383	4158	1784 (1755)	(2304)	2589	3079	3569	4383	7408	8497	8992	9762	10545	11712	8394	9629	10190	11063	11949	13273
	13.7	-	-	-	-	-	-	-	-	2814	3344	3873	4756	7712	8847	9362	10164	10978	12194	8763	10052	10638	11549	12474	13856
	15.0	-	-	-	-	-	-	-	-	-	3677	4256	5227	-	-	-	-	-	-	9195	10547	11162	12117	13088	14538
194	7.6	1010 (990)	(1314)	1471	-	-	-	-	-	-	-	-	-	4571	5243	5549	6024	6506	7227	-	-	-	-	-	-
	8.3	1127 (1108)	(1461)	1637	-	-	-	1186 (1167)	(1539)	1726	2059	2383	2922	4932	5657	5987	6499	7020	7798	4566	5238	5543	6017	6500	7219
	9.5	(1314)	(1716)	1922	2294	2647	3255	1402 (1372)	(1804)	2030	2412	2794	3432	7191	8248	8729	9476	10236	11369	6720	7708	8158	8856	9566	10625
	10.9	(1539)	(2010)	2255	2677	3099	3814	1637 (1608)	(2118)	2383	2834	3275	4020	7945	9114	9645	10471	11310	12562	7483	8583	9084	9861	10651	11831
	12.7	(1804)	(2373)	2677	3177	3677	4511	1941 (1912)	(2510)	2824	3353	3883	4766	10247	11754	12439	13504	14586	16202	9718	11147	11797	12807	13833	15365
	15.1	-	-	-	-	-	-	-	-	-	4040	4677	5737	-	-	-	-	-	-	10821	12412	13136	14261	15403	17109
219	6.7	931	-	-	-	-	-	-	-	-	-	-	-	3505	4021	4255	4619	4989	5542	-	-	-	-	-	-
	7.7	1117 (1098)	(1441)	1618	-	-	-	-	-	-	-	-	-	4955	5684	6015	6531	7054	7835	5579	6399	6772	7352	7941	8821
	8.9	1333 (1304)	(1716)	1931	2294	2657	-	1471 (1441)	(1892)	2128	2540	2932	-	5629	6457	6833	7419	8013	8900	6426	7371	7801	8469	9148	10161
	10.2	1559 (1529)	(2020)	2265	2696	3118	3824	1726 (1696)	(2226)	2500	2971	3442	4226	6564	7529	7968	8651	9344	10379	7572	8686	9192	9980	10779	11973
	11.4	(1735)	(2285)	2569	3059	3540	4344	1961 (1922)	(2530)	2844	3383	3912	4795	8922	10234	10831	11758	12700	14107	12093	13872	14680	15937	17214	19121
	12.7	(1961)	(2579)	2902	3442	3991	4893	2206 (2167)	(2853)	3206	3805	4413	5413	11208	12857	13606	14771	15955	17722	13099	15025	15901	17262	18646	20711
	14.2	(2216)	(2916)	3275	3893	4501	5521	2490 (2441)	(3216)	3618	4305	4981	6109	12033	13803	14608	15858	17129	19026	14136	16215	17161	18630	20123	22351
245	7.9	1294 (1274)	(1676)	1882	-	-	-	-	-	-	-	-	-	5075	5821	6161	6688	7224	8024	-	-	-	-	-	-
	8.9	1500 (1471)	(1941)	2177	2569	3000	-	1627 (1598)	(2108)	2373	2814	3255	-	5631	6460	6836	7422	8016	8904	6727	7717	8166	8866	9576	10636
	10.0	1726 (1686)	(2226)	2500	2971	3442	4226	1873 (1843)	(2422)	2716	3236	3746	4586	6468	7419	7852	8524	9207	10227	7812	8962	9484	10296	11121	12353
	11.1	(1902)	(2510)	2814	3353	3873	4756	2108 (2069)	(2726)	3069	3648	4217	5178	8758	10046	10632	11542	12467	13847	10668	12237	12950	14059	15185	16867
	12.0	(2079)	(2736)	3079	3658	4226	5197	2304 (2265)	(2981)	3353	3981	4609	5658	10795	12383	13105	14227	15367	17068	13222	15166	16050	17425	18821	20905
	13.8	(2422)	(3187)	3589	4266	4932	6060	2687 (2638)	(3471)	3903	4648	5374	6600	11831	13571	14363	15592	16842	18707	14613	16763	17740	19259	20802	23106
	15.9	-	-	-	-	-	-	-	-	-	5403	6256	7678	-	-	-	-	-	-	16013	18368	19439	21103	22794	25319

Table A.3 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
273	7.1	1157 (1137)	(1490)	1676	-	-	-	-	-	-	-	-	-	3808	4368	4623	5018	5420	6021	-	-	-	-	-	-
	8.9	1657 (1627)	(2137)	2402	2863	3314	-	-	-	-	-	-	-	5850	6711	7102	7710	8328	9250	-	-	-	-	-	-
	10.2	1941 (1912)	(2510)	2824	3353	3883	4776	-	-	-	-	-	-	7130	8179	8655	9396	10149	11273	-	-	-	-	-	-
	11.4	2206 (2167)	(2853)	3206	3814	4413	5423	-	-	-	-	-	-	8523	9776	10346	11232	12132	13476	-	-	-	-	-	-
	12.6	2471 (2422)	(3197)	3589	4266	4932	6060	-	-	-	-	-	-	9137	10481	11092	12042	13007	14448	-	-	-	-	-	-
	13.8	2726 (2677)	(3530)	3962	4717	5452	6698	-	-	-	-	-	-	10578	12133	12841	13940	15057	16724	-	-	-	-	-	-
299	8.5	1676 (1647)	(2167)	2441	-	-	-	-	-	-	-	-	-	5624	6451	6827	7412	8005	8892	-	-	-	-	-	-
	9.5	1912 (1882)	(2481)	2785	3304	3834	4707	-	-	-	-	-	-	6740	7731	8182	8883	9594	10657	-	-	-	-	-	-
	11.1	2294 (2255)	(2961)	3334	3962	4589	5629	-	-	-	-	-	-	8362	9592	10151	11020	11903	13221	-	-	-	-	-	-
	12.4	2599 (2549)	(3363)	3775	4491	5197	6374	-	-	-	-	-	-	9042	10372	10977	11917	12871	14297	-	-	-	-	-	-
	14.8	(3099)	(4079)	4589	5452	6305	7737	-	-	-	-	-	-	12890	14786	15648	16988	18349	20382	-	-	-	-	-	-
324	8.5	1784	-	-	-	-	-	-	-	-	-	-	-	5723	6565	6948	7543	8147	9049	-	-	-	-	-	-
	9.5	2039 (2000)	(2628)	2961	3520	-	-	-	-	-	-	-	-	6299	7225	7646	8301	8966	9959	-	-	-	-	-	-
	11.0	2412 (2373)	(3118)	3510	4167	4825	5923	-	-	-	-	-	-	7716	8851	9367	10169	10984	12201	-	-	-	-	-	-
	12.4	2765 (2716)	(3569)	4011	4776	5521	6776	-	-	-	-	-	-	11783	13516	14304	15529	16773	18631	-	-	-	-	-	-
	14.0	3157 (3099)	(4079)	4589	5452	6315	7757	-	-	-	-	-	-	12781	14660	15515	16844	18193	20208	-	-	-	-	-	-
340	8.4	1824	-	-	-	-	-	-	-	-	-	-	-	5583	6404	6778	7358	7947	8828	-	-	-	-	-	-
	9.7	2157 (2118)	(2794)	3138	3736	-	-	-	-	-	-	-	-	7243	8308	8792	9545	10310	11452	-	-	-	-	-	-
	10.9	2471 (2432)	(3197)	3589	4275	-	-	-	-	-	-	-	-	8265	9481	10033	10893	11765	13068	-	-	-	-	-	-
	12.2	2814 (2755)	(3628)	4079	4854	5619	-	-	-	-	-	-	-	9768	11205	11858	12874	13905	15445	-	-	-	-	-	-
	13.1	3040 (2991)	(3932)	4422	5256	6080	7463	-	-	-	-	-	-	10244	11751	12436	13501	14583	16198	-	-	-	-	-	-
	14.0	3275 (3216)	(4226)	4756	5648	6541	8031	-	-	-	-	-	-	10688	12260	12975	14086	15214	16899	-	-	-	-	-	-
	15.4	-	-	-	6266	7257	8904	-	-	-	-	-	-	12265	14068	14889	16163	17458	19392	-	-	-	-	-	-

Note – Strength property values in parentheses only apply to pipe of Make E; values without parentheses apply to pipe of both Make A and B.

Table A.4 – Strength derating factors for GOST 632 round thread connections at bending (λ)

Pipe diameter, mm	Pipe grade					
	Д	К	Е	Л	М	Р
114.3	0.030	0.023	0.020	0.017	0.014	0.012
127.0	0.034	0.026	0.023	0.020	0.017	0.014
139.7	0.038	0.029	0.025	0.022	0.019	0.015
146.1	0.040	0.030	0.027	0.023	0.020	0.016
168.3	0.046	0.035	0.031	0.027	0.023	0.019
177.8	0.050	0.038	0.033	0.029	0.025	0.020
193.7	0.054	0.042	0.037	0.032	0.027	0.022
219.1	0.066	0.050	0.044	0.037	0.032	0.027
244.5	0.074	0.054	0.050	0.042	0.036	0.030
273.1	0.084	0.064	0.057	0.048	0.041	0.034
298.5	0.095	0.072	0.064	0.054	0.046	0.038
323.9	0.106	0.080	0.072	0.060	0.052	0.043
339.7	0.113	0.086	0.076	0.064	0.055	0.045
351.0	0.122	0.092	0.082	0.069	0.060	-
377.0	0.135	0.102	0.090	0.077	-	-
406.4	0.137	0.104	0.093	-	-	-
426.0	0.160	0.122	0.108	-	-	-
473.1	0.168	0.128	-	-	-	-
508.0	0.183	-	-	-	-	-
Note: $n' = \frac{n}{1 - n \lambda (\alpha_0 - 0,5)}$, where n', n – tensile strength safety factor with and without bending, respectively; α_0 – pipe deviation rate.						

Table A.5 – Permissible tensile loads for GOST 632 trapezoidal thread connections (OTTM and OTTF)

Nominal outside diameter of pipe (mm)	Wall thickness (mm)	Permissible tensile loads for GOST 632 OTTM and OTTF casing with Make A couplings of normal diameter (adjusted for thread connection safety factor equal to 1.75 of failure load) (kN)					Permissible tensile loads for GOST 632 OTTM and OTTF casing with Make B couplings of normal diameter (adjusted for thread connection safety factor equal to 1.8 of failure load) (kN)					Outside diameter of coupling (mm)	Permissible tensile loads for GOST 632 OTTM and OTTF casing with Make A special couplings of reduced outside diameter (adjusted for thread connection safety factor equal to 1.75 of failure load) (kN)					Permissible tensile loads for GOST 632 OTTM and OTTF casing with Make B special couplings of reduced outside diameter (adjusted for thread connection safety factor equal to 1.8 of failure load) (kN)					
		Д	Е	Л	М	Р	Д	К	Е	Л	М		Р	Д	Е	Л	М	Р	Д	Е	Л	М	Р
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
114	6,4	657 ¹	696	765	873	-	-	-	-	-	-	-	123,8	657 ¹	696	765	873	-	-	-	-	-	-
	7,4	755 ¹	823	902	1029	1196	715 ²	794	804	882	1000	1157		755 ¹	823	931	1029	1196	725 ²	804	882	1000	1157
	8,6	863 ¹	971	1069	1216	1402	823 ²	941	941	1039	1179	1363		823 ¹	873	961	1088	1255	804	843	931	1059	1225
	10,2	1010 ¹	1118	1235	1402	1628	-	-	-	-	-	-		823 ¹	873	961	1088	1255	-	-	-	-	-
127	6,4	735 ¹	784	863	980	-	-	-	-	-	-	-	136,5	735 ¹	784	863	980	-	-	-	-	-	-
	7,5	853 ¹	941	1029	1167	1353	804 ²	902	912	1000	1137	1323		853 ¹	941	1029	1167	1353	823 ²	912	1000	1137	1323
	9,2	1029 ¹	1167	1284	1461	1696	980 ²	1127	1137	1255	1422	1647		922 ¹	971	1069	1216	1412	902	941	1039	1186	1372
	10,7	1186 ¹	1363	1500	1706	1981	-	-	-	-	-	-		922 ¹	971	1069	1216	1412	-	-	-	-	-
140	6,2	784 ¹	-	-	-	-	-	-	-	-	-	-	149,2	784 ¹	-	-	-	-	-	-	-	-	-
	7,0	882 ¹	961	1059	1196	-	-	-	-	-	-	-		882 ¹	961	1059	1196	-	-	-	-	-	-
	7,7	971 ¹	1069	1177	1333	1549	912 ²	1039	1039	1137	1294	1510		971 ¹	1069	1177	1333	1549	931 ²	10399	1137	1294	1510
	9,2	1137 ¹	1294	1422	1618	1883	1078 ²	1255	1255	1382	1578	1824		1029	1088	1196	1363	1579	1010	1059	1167	1323	1539
146	10,5	1294 ¹	1490	1637	1863	2157	1216 ²	1441	1451	1588	1814	2098	156,0	1029	1088	1196	1363	1579	1010	1059	1167	1323	1539
	6,5	863 ¹	-	-	-	-	-	-	-	-	-	-		863 ¹	-	-	-	-	-	-	-	-	-
	7,0	931 ¹	-	-	-	-	-	-	-	-	-	-		931 ¹	-	-	-	-	-	-	-	-	-
	7,7	1020 ¹	1118	1235	1402	-	961 ²	1088	1088	1196	1363	-		1020 ¹	1118	1235	1402	-	156,0	980 ²	1088	1196	1363
	8,5	1108 ¹	1245	1373	1559	1814	1049 ²	1206	1216	1333	1520	1765		1118	1177	1294	1471	1706	-	1076	1147	1255	1431
	9,5	1226 ¹	1412	1549	1755	2040	1167 ²	1363	1372	1510	1706	1981		1118	1177	1294	1471	1706	-	-	-	-	-
168	10,7	1373 ¹	1598	1755	1991	2314	1304 ²	1539	1549	1706	1941	2245	177,8	-	-	-	-	-	-	-	-	-	-
	7,3	1118 ¹	1226	-	-	-	-	-	-	-	-	-		1118 ¹	1226	-	-	-	-	-	-	-	-
	8,0	1226 ¹	1353	1490	-	-	1157 ²	1314	1324	-	-	-		1216 ¹	1333	1461	-	-	1157 ²	1314	1324	-	-
	8,9	1353 ¹	1530	1677	1912	2216	1274 ²	1480	1480	1627	1853	2157		1265	1333	1461	1667	1932	1274 ²	1480	1480	1627	1853
	10,6	1588 ¹	1843	2020	2304	2667	1500 ²	1784	1784	1971	2235	2589		1265	1333	1461	1667	1932	1500 ²	1784	1784	1971	2235
178	12,1	1804 ¹	2108	2324	2638	3059	1706 ²	2039	2049	2255	2569	2971	187,3	-	-	-	-	-	1706 ²	2039	2049	2255	2569
	6,9	1118 ¹	-	-	-	-	-	-	-	-	-	-		1128 ¹	-	-	-	-	-	-	-	-	-
	8,1	1304 ¹	1461	1608	-	-	1235 ²	1412	1422	1559	-	-		1314 ¹	1432	1579	-	-	187,3	1255 ²	1392	1529	1745
	9,2	1480 ¹	1676	1843	2098	2432	1392 ²	1627	1627	1794	2039	2363		1363	1432	1579	1794	2079	-	1323	1392	1529	1745
	10,4	1667 ¹	1912	2098	2393	2775	1569 ²	1853	1863	2049	2324	2696		1363	1432	1579	1794	2079	-	-	-	-	-
	11,5	1814 ¹	2128	2334	2657	3079	1726 ²	2059	2069	2275	2579	2991		-	-	-	-	-	-	-	-	-	-
	12,7	2000 ¹	2285	2510	2854	3314	1882 ²	2275	2216	2441	2775	3216		-	-	-	-	-	-	-	-	-	-
	13,7	-	2285	2510	2854	3314	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	15,0	-	-	2510	2854	3314	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
194	7,6	1343 ¹	-	-	-	-	-	-	-	-	-	-	206,4	1353 ¹	-	-	-	-	-	-	-	-	-
	8,3	1471 ¹	1637	1804	2049	2383	-	-	-	-	-	-		1471 ¹	1637	1304	2049	2383	-	-	-	-	-
	9,5	1677 ¹	1902	2089	2373	2755	1578 ²	1843	1853	2030	2314	2677		1667 ¹	1902	2089	2373	2755	1608 ²	1853	2030	2314	2677
	10,9	1892 ¹	2206	2422	2755	3197	1794 ²	2128	2137	2353	2677	3099		1892	1991	2196	2491	2893	1833	1941	2128	2422	2814
	12,7	2187 ¹	2579	2834	3216	3736	2059 ²	2490	2500	2745	3128	3628		1892	1991	2196	2491	2893	-	-	-	-	-
	15,1	-	-	3383	3844	4452	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-

Table A.5 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
219	7,7	1549 ¹	-	-	-	-	-	-	-	-	-	-	231,8	1549 ¹	-	-	-	-	-	-	-	-	-
	8,9	1785 ¹	2000	2216	2520	-	1686 ²	1892	1951	2157	2451	-		1785 ¹	2000	2216	2520	-	1716 ²	1951	2157	2451	-
	10,2	2030 ¹	2314	2569	2922	3393	1922 ²	2186	2245	2500	2844	3295		2030 ¹	2295	2530	2873	3334	1951 ²	2235	2461	2794	3236
	11,4	2255 ¹	2520	2893	3295	3815	2128 ²	2392	2451	2814	3197	3707		2187	2295	2530	2873	3334	2128	2235	2461	2794	3236
	12,7	2500 ¹	2903	3236	3687	4266	2363 ²	2745	2824	3148	3579	4148		2187	2295	2530	2873	3334	2128	2235	2461	2794	3236
	14,2	-	3256	3628	4128	4786	2618 ²	3089	3857	3530	4011	4658		-	-	-	-	-	2128	2235	2461	2794	3236
245	7,9	1755	-	-	-	-	-	-	-	-	-	-	257,2	1755	-	-	-	-	-	-	-	-	-
	8,9	2000 ¹	2246	2491	2824	-	-	-	-	-	-	-		2000 ¹	2246	2481	2824	-	1922 ²	2186	2422	2745	-
	10,0	2236 ¹	2540	2824	3216	3726	1882 ²	2118	2186	2422	2745	3618		2236 ¹	2540	2814	3197	3707	2147 ²	2471	2736	3118	3608
	11,1	2471 ¹	2834	3158	3589	4168	2108 ²	2402	2471	2745	3118	4050		2432	2559	2814	3197	3707	2363	2490	2736	3118	3608
	12,0	2657 ¹	3079	3432	3903	4521	2334 ²	2677	2755	3069	3491	4393		2432	2559	2814	3197	3707	2363	2490	2736	3118	3608
	13,8	3040 ¹	3560	3962	4511	5227	2510 ²	2902	2991	3334	3795	5080		-	-	-	-	-	-	-	-	-	-
273	15,9	-	-	4580	5197	6041	-	-	-	-	-	-	285,3	2206	2491	2795	3177	-	2147	2412	2716	3089	-
	8,9	2206	2491	2795	3177	-	2118 ²	2334	2412	2716	3089	-		2550	2854	3138	3569	4138	2461 ²	2775	3049	3471	4020
	10,2	2550	2873	3236	3687	4276	2412 ²	2696	2794	3148	3579	4158		2716	2854	3138	3569	4138	2638	2775	3049	3471	4020
	11,4	2844 ¹	3226	3648	4148	4815	2687 ²	3030	3138	3550	4040	4677		2716	2854	3138	3569	4138	2638	2775	3049	3471	4020
	12,6	3128 ¹	3579	4050	4609	5345	2951 ²	3373	3481	3932	4481	5197		-	-	-	-	-	-	-	-	-	-
	13,8	3403 ¹	3942	4452	5070	5884	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
299	15,1	-	4325	4884	5560	6453	-	-	-	-	-	-	285,3	-	-	-	-	-	-	-	-	-	-
	16,5	-	-	5315	6080	7051	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	8,5	2285	-	-	-	-	-	-	-	-	-	-	299	-	-	-	-	-	-	-	-	-	-
	9,5	2569	-	-	-	-	2471	2726	2834	3197	3481	-		-	-	-	-	-	-	-	-	-	-
	11,1	3040	3432	3873	4217	-	2873 ²	3216	3334	3765	4099	-		-	-	-	-	-	-	-	-	-	-
	12,4	3383 ¹	3854	4354	4736	5776	3197 ²	3618	3746	4236	4609	5609		-	-	-	-	-	-	-	-	-	-
324	14,8	-	4609	5197	5943	6943	-	-	-	-	-	-	324	-	-	-	-	-	-	-	-	-	-
	9,5	2795	3158	3579	-	-	2677	2961	3079	3481	3962	-		-	-	-	-	-	-	-	-	-	-
	11,0	3265	3697	4177	4766	-	3099 ²	3461	3589	4060	4638	-		-	-	-	-	-	-	-	-	-	-
	12,4	3687 ¹	4187	4746	5413	6286	2677	2961	3079	3481	3962	-		-	-	-	-	-	-	-	-	-	-
	14,0	4138 ¹	4746	5364	6119	7139	-	-	-	-	-	6119		-	-	-	-	-	-	-	-	-	-
	9,7	3001	3393	3844	-	-	2873	3187	3304	3736	-	-	340	-	-	-	-	-	-	-	-	-	-
340	10,9	3383	3844	4344	-	-	3226 ²	3608	3736	4226	-	-		-	-	-	-	-	-	-	-	-	-
	12,2	3805 ¹	4325	5031	5580	-	3599 ²	4060	4207	4756	5423	-		-	-	-	-	-	-	-	-	-	-
	13,1	4079 ¹	4658	5276	6021	7002	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	14,0	4344 ¹	4991	5649	6453	7512	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	15,4	-	-	6208	7080	8287	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-

Notes:

For Make A pipe

1 – permissible loads at which stresses in the pipe body reach 0.8 of the yield strength (safety factor = 1.25)

For Make B pipe

2 – permissible loads at which stresses in the pipe body reach 0.77 of the yield strength (safety factor = 1.3)

The permissible tensile loads given in this Annex apply to vertical holes and holes with deviation rate up to 3.5° per 10 m.

Table A.6 – Reduction in permissible tensile load for GOST 632 trapezoidal threads at bending

Diameter (mm)	Rate of deviation (°/10 m)	
	≤ 3	≤ 5
114.3 – 168.3	0	0
177.8 – 340.0	0	by 10%

Table A.7 – Approximate makeup torque values for casing with GOST 632 trapezoidal thread connections (OTTM, OTTF)

Nominal outside diameter (mm)	Wall thickness (mm)	Makeup torque values for casing with GOST 632 OTTM trapezoidal thread connections (N·m)						Makeup torque values for casing with GOST 632 OTTF trapezoidal thread connections (N·m)					
		Pipe grade						Pipe grade					
		Д	К	Е	Л	М	Р	Д	К	Е	Л	М	Р
1	2	3	4	5	6	7	8	9	10	11	12	13	14
114.3	5,7	4242	4866	5150	5591	6039	6708	-	-	-	-	-	-
	6,4	4791	5496	5816	6314	6820	7575	-	-	-	-	-	-
	7,4	5963	6840	7239	7859	8489	9429	-	-	-	-	-	-
	8,6	6715	7703	8152	8850	9559	10618	5072	5181	5235	5325	5425	5588
	10,2	7545	8655	9159	9943	10740	11929	6077	6250	6337	6481	6639	6899
127.0	6,4	5062	5807	6146	6672	7206	8005	-	-	-	-	-	-
	7,5	5878	6743	7136	7747	8368	9295	-	-	-	-	-	-
	9,2	7549	8660	9165	9949	10747	11937	5801	5947	6020	6142	6276	6495
	10,7	8369	9600	10160	11030	11914	13233	6804	7023	7133	7315	7516	7845
139.7	6,2	5110	5862	6203	6734	7274	8080	-	-	-	-	-	-
	7,0	6035	6922	7326	7953	8590	9542	-	-	-	-	-	-
	7,7	6864	7873	8332	9046	9771	10853	-	-	-	-	-	-
	9,2	7912	9075	9605	10427	11262	12510	6068	6226	6305	6437	6582	6819
	10,5	8673	9948	10528	11429	12345	13712	7001	7228	7341	7530	7738	8078
146.1	6,5	5798	6651	7039	7641	8254	9168	-	-	-	-	-	-
	7,0	6279	7202	7622	8275	8938	9928	-	-	-	-	-	-
	7,7	7533	8641	9145	9928	10724	11911	-	-	-	-	-	-
	8,5	8250	9463	10015	10873	11744	13044	6308	6458	6533	6659	6797	7023
	9,5	9062	10394	11000	11942	12899	14328	6829	7010	7100	7251	7417	7688
	10,7	9930	11390	12054	13086	14135	15700	7820	8070	8194	8402	8631	9005
168.3	7,3	6832	7836	8293	9003	9725	10802	-	-	-	-	-	-
	8,0	7467	8566	9065	9841	10630	11807	-	-	-	-	-	-
	8,9	8214	9422	9971	10825	11692	12987	6364	6554	6648	6806	6980	7263
	10,6	10299	11813	12502	13572	14660	16283	8141	8421	8561	8794	9050	9470
	12,1	11303	12966	13722	14897	16090	17872	10450	11150	11501	12084	12726	13777

Table 7 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
177.8	6.9	6500	7456	7890	8566	9252	10277	-	-	-	-	-	-
	8.1	7592	8709	9217	10006	10808	12005	-	-	-	-	-	-
	9.2	9231	10589	11206	12166	13140	14596	-	-	-	-	-	-
	10.4	10138	11629	12307	13360	14431	16029	8021	8295	8432	8661	8913	9325
	11.5	10871	12470	13197	14327	15475	17189	8955	9314	9494	9793	10123	10662
	12.7	11583	13286	14061	15265	16488	18314	9932	10396	10628	11014	11439	12135
	13.7	12115	13897	14708	15967	17246	19156	10763	11323	11604	12071	12585	13426
	15.0	12739	14612	15464	16788	18133	20142	11883	12583	12933	13516	14157	15207
193.7	7.6	7987	9161	9695	10525	11369	12628	-	-	-	-	-	-
	8.3	8726	10010	10593	11500	12422	13797	-	-	-	-	-	-
	9.5	10773	12358	13078	14198	15336	17034	7345	7575	7689	7880	8090	8434
	10.9	12062	13836	14642	15896	17170	19071	8995	9331	9500	9780	10089	10594
	12.7	13492	15476	16379	17781	19206	21333	10974	11477	11728	12147	12607	13361
	15.1	15089	17308	18317	19885	21479	23857	13451	14224	14610	15253	15961	17120
219.1	7.7	8826	10124	10714	11632	12564	13955	-	-	-	-	-	-
	8.9	10241	11748	12432	13497	14578	16193	6426	6632	6734	6906	7094	7402
	10.2	12133	13917	14729	15990	17271	19184	8431	8739	8893	9151	9433	9896
	11.4	13890	15933	16862	18305	19772	21962	10329	10749	10959	11309	11694	12324
	12.7	15089	17308	18318	19886	21479	23858	11459	12017	12297	12762	13274	14112
	14.2	16327	18728	19820	21517	23241	25815	13768	14510	14881	15499	16179	17291
244.5	7.9	9077	10412	11019	11962	12920	14351	-	-	-	-	-	-
	8.9	10245	11752	12437	13502	14584	16199	6497	6728	6844	7037	7249	7597
	10.0	11930	13685	14482	15722	16982	18863	8272	8601	8765	9038	9339	9832
	11.1	13602	15602	16512	17926	19362	21506	10083	10523	10743	11110	11513	12173
	12.0	14468	16596	17564	19068	20595	22876	11266	11809	12080	12532	13029	13843
	13.8	16022	18379	19451	21116	22808	25334	13550	14328	14717	15365	16078	17245
	15.9	17585	20172	21348	23176	25033	27805	16128	17231	17783	18702	19713	21367
273.1	8.9	10235	11740	12425	13489	14569	16183	6563	6823	6953	7170	7408	7798
	10.2	12660	14522	15368	16684	18021	20017	8974	9364	9560	9885	10243	10828
	11.4	13895	15938	16867	18312	19779	21969	10641	11173	11439	11882	12370	13167
	12.6	15012	17220	18223	19784	21369	23736	12256	12949	13296	13873	14509	15548
	13.8	16027	18384	19456	21121	22814	25340	13833	14708	15145	15874	16676	17988
	15.1	17026	19530	20669	22439	24237	26921	15515	16609	17156	18068	19070	20711
	16.5	18002	20650	21854	23725	25626	28464	17310	18667	19345	20475	21719	23754

Table 7 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
323.9	8.5	9932	11393	12057	13090	14138	15704	-	-	-	-	-	-
	9.5	11077	12706	13447	14598	15768	17514	-	-	-	-	-	-
	11	13766	15790	16711	18142	19595	21765	-	-	-	-	-	-
	12.4	15159	17388	18402	19977	21578	23968	-	-	-	-	-	-
	14	16576	19014	20123	21846	23596	26209	-	-	-	-	-	-
Note – Makeup torque values listed in this Table shall be only considered a guide and may be adjusted in the course of acquisition of statistical data for specific thread connection assembly conditions.													

Annex B

List of Referenced Documents

- [1] GOST 632-80. Casing pipes and couplings for them. Specifications
- [2] GOST R 51906-2002. Thread connections for casing, tubing and pipelines and thread gauges for them. General technical requirements
- [3] GOST R 53366-2009. (ISO 11960:2004) Steel pipe for use as casing and tubing in petroleum and natural gas industry. General technical requirements
- [4] API Specification 5B. Specification for threading, gauging and thread inspection of casing, tubing and line pipe threads
- [5] API Specification 5CT/ISO 11960:2004. Specification for casing and tubing
- [6] API RP 5A3-96. Recommended Practice on thread compounds for casing, tubing and line pipe
- [7] ISO 10405:2000. Petroleum and natural gas industry – Recommended Practice for care and use of casing and tubing
- [8] PB 08-624-03. Petroleum and natural gas industry safety code
- [9] TU 1321-197-00147016-01. Extreme-line steel casing
- [10] TU 1321-205-00147016-01. Casing and casing couplings, CO₂-resistant and H₂S-resistant
- [11] TU 1321-261-00147016-03. Steel casing, internal-flush, 102, 110 mm in diameter, shouldered within small-size couplings (OTT)
- [12] TU 14-157-11-98. Steel casing with packing assembly made of polymeric material
- [13] TU 14-157-24-92. Casing and casing couplings, cold-resistant
- [14] TU 14-157-47-97. Casing and casing couplings with buttress thread, corrosion-resistant and cold-resistant
- [15] TU 14-157-75-2001, TU 14-157-83-2002, TU 14-157-91-2003, TU 14-157-92-2003. Casing with TMK-FMC enhanced leak resistance thread connection and couplings thereto
- [16] TU 14-157-93-2007. Steel seamless casing, H₂S-resistant, and couplings thereto, with TMK-FMC (VARM) enhanced leak resistance thread connection
- [17] TU 14-157-97-2007. Steel seamless casing and cold-resistant couplings thereto with TMK GF enhanced leak resistance thread connection
- [18] TU 14-157-99-2005. Seamless extreme-line H₂S-resistant steel casing and couplings thereto with TMK1 enhanced leak resistance thread connection
- [19] TU 14-157-77-01. Seamless steel casing, cold-resistant
- [20] TU 14-161-149-94. Casing and casing couplings, H₂S-resistant and cold-resistant
- [21] TU 14-161-162-95. Casing and casing couplings for wellhead completion
- [22] TU 14-161-163-96. Casing 102, 110 mm in diameter with subsize couplings
- [23] TU 14-161-175-98. Steel casing and couplings thereto
- [24] TU 14-161-180-99. Seamless casing and couplings thereto, H₂S-resistant, CO₂-resistant and cold-resistant
- [25] TU 14-161-193-2001. Seamless casing and couplings thereto, H₂S-resistant, CO₂-resistant and cold-resistant

- [26] TU 14-161-204-2002. Steel casing, cold-resistant, and couplings thereto for gas and gas-condensate fields
- [27] TU 14-162-13-95. Seamless casing with buttress thread connection and couplings thereto
- [28] TU 14-162-41-98. Seamless casing, enhanced leak resistance, size 324 mm, with OTTT thread connection, and couplings thereto
- [29] TU 14-162-53-2004. Casing TTL-01 and couplings thereto for directional and horizontal holes with hole deviation rate up to 5°/10 m
- [30] TU 14-162-102-2000. Longitudinal electric-welded casing and couplings thereto
- [31] TU 14-3-514-76. Casing and casing couplings
- [32] TU 14-3-714-78, TU 14-157-76-2001. Plain-end extreme-line casing with OF1M thread connection
- [33] TU 14-ZR-29-2007. Steel casing, seamless and electric-welded, and couplings thereto, heavy-duty, with buttress thread connection
- [34] TU 14-ZR-76-2004. Casing and casing couplings, cold-resistant
- [35] TU 14-ZR-82-2005. Casing and casing couplings, cold-resistant for OAO GAZPROM
- [36] TU 39.0147016-63-96. Casing and casing couplings with buttress thread
- [37] TU 39-0147016-106-2000. Steel casing, internal-flush, and couplings thereto (OTY)
- [38] Design manual for oil and gas well casing strings. Moscow, 1997.
- [39] Recommended Practice for selection of thread connections for casing, drill pipe and tubing used in construction of slanted holes, horizontal holes and downhole splitters
- [40] Recommended Practice for operation and rejecting inspection of casing at petroleum and natural gas production facilities. Moscow, 2000
Guidelines for investigation of industrial accidents with drill pipe, casing and tubing, and for claim documenting. Moscow, 1997
- [41] API RP 5C1. Recommended Practice for care and use of casing and tubing
- [42] API RP 5B1. Recommended Practice for gauging and inspection of casing, tubing and line pipe threads
- [43] API RP 5A3. Recommended Practice on thread compounds for casing, tubing and line pipe, 2nd Edition. July 2003.
- [44] ISO 10400. Petroleum and natural gas industry – Equations and calculations for the properties of casing, tubing, drill pipe and line pipe used as casing or tubing
- [45] Catalog of thread connections (TMK publication)
- [46] Guidelines for investigation of industrial accidents with drill pipe, casing and tubing, and for claim documenting. Moscow, 1997

Abbreviations Used in This Document

OTTM

casing with trapezoidal thread and couplings thereto

OTTI

casing with trapezoidal thread connection, enhanced leak resistance

BC

buttress thread connection

OTY

buttress thread connection with "metal-to-metal" packing

UPTO and KO

administration for equipment maintenance, service, procurement and integration

CBPO

central production support shop

CTB

central pipe yard

AKO

automatic casing tongs

AKB

automatic drill pipe tongs

OTT

enhanced leak resistance casing with radial end-face packing

OT1M

enhanced leak resistance casing

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

