PREMIUM SERVICE

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06 04 2018

Guidelines
for Use of Casing with
TMK UP FMC Thread Connection with GW Compound

RE PS 05-007-2015

Revision 3

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Contents

Introduction

The present guidelines are worked out taking into account the requirements of the following documents:

- API RP 5C1 Recommended Practice for Care and Use of Casing and Tubing;
- API RP 5B1 Gaging and Inspection of Casing, Tubing and Pipe Line Threads;
- ISO 10405 Petroleum and Natural Gas Industries – Care and Use of Casing and Tubing.
- TR CU 010/2011 – Technical Regulations of EAEC “on the Safety of Machinery and Equipment”.

Guidelines for Use of Casings with TMK UP FMC Thread Connection with GW Compound

Effective date is May 06, 2018

With an option of early introduction

1 Scope

The present guidelines contain recommendations for maintenance and use of casing with TMK UP FMC thread connection with GW compound under field conditions, including pipe preparation and make-up, string running and pulling operations, as well as guidelines for pipe handling, storage and inspection during operation.

2 Normative references

The present guidelines contain normative references to the following documents:

API RP 5A3/ISO 13678 Recommended Practice on Thread Compounds for Casing, Tubing and Line Pipe;

TU 0254-001-46977243-2002 RUSMA-1, RUSMA-1(3) Thread Compounds;

TU 0254-062-46977243-2008 RUSMA-1i Inhibited Thread Compound;

TU 0254-031-46977243-2004 RUSMA R-4, RUSMA R-4(3) Thread Compounds;

TU 0254-068-46977243-2011 RUSMA R-14 Special Thread Compound;

TU 19.20.29-186-46977243-2016 RUSMA R-24Cu Arctic Thread Compound.

TU 0254-102-46977243-2011 RUSMA SP Thread Compound;

N o t e – The specified document revision shall be applied for dated references. The latest valid revision shall be applied for undated references.

3 Terms and definitions

For the purposes of the present guidelines the standard terms as well as the following terms and definitions shall be applied:

3.1 **metal-to-metal seal:** Seal or sealing system, that relies on intimate and usually high contact stress of a metal surface to achieve a seal.

3.2 **rotation on shoulder:** Excessive turns after shoulder to ensure thread connection tightness.

3.3 **pin (pin connection):** A thread connection on Oil Country Tubular Goods (OCTG) that has external (male) threads and/or seal, shoulder.

3.4 **box (box connection):** A thread connection on Oil Country Tubular Goods (OCTG) that has internal (female) threads and/or seal, shoulder.

3.5 **thread seals:** Box seal and pin seal.

3.6 **thread shoulders:** Pin shoulder and box shoulder.

3.7 **pin shoulder:** Pin face which serves as an arrester during make-up.

3.8 **box shoulder:** Internal barrier which serves as an arrester during make-up.

3.9 **pin seal:** Area of the pin external surface which provides for tightness of the thread connection during make-up.

3.10 **box seal:** Area of the box internal surface which provides for tightness of the thread connection during make-up.

3.11 **GW:** Green Well compound.

4 Transportation, handling operations and storage

4.1 Transportation

4.1.1 When pipes are transported by sea, railroad (railcars) or trucks, Cargo Shipping Rules and Technical Provisions for Cargo Handling and Fastening applicable to the particular transport type shall be observed.

4.1.2 Pipe transportation, handling and storage shall be carried out with thread protectors screwed on pin and coupling end faces in order to protect thread surface, thread shoulders and thread seals from exposure.

4.1.3 Pipe bundles of different lots and standard sizes can be loaded into same means of transportation, but have to be separated.

4.1.4 Pipe bundles shall be securely fastened during transportation to avoid any movement. Wooden blocks can be used for fastening purposes.

When several pipes bundles are stacked or not bundled pipes are stacked into several ranks, pipe bundles and pipe ranks shall be separated by at least three wooden blocks, with the thickness from 1.3780 inch to 1.5748 inch each, so that weight of upper pipe ranks is not distributed onto couplings of lower ranks.

4.1.5 When transported by sea, pipe bundles shall not be placed in water inside the vessel's hold or in any other corrosive environment. Dragging of bundles along the piles or hitting bundles against hatches or rails is strictly forbidden.

4.1.6 When loading pipe bundles into railway cars or trucks, wooden girders (blocks) shall be provided for car floors or vehicle beds to ensure required distance between the products and uneven bottom of the vehicle. No blocks shall be placed under couplings.

4.1.7 Pipes from chromium and corrosion-resistant steel shall be packaged using wooden or plastic beds.

4.1.8 In order to avoid hitting of pipes against vehicle metal elements or protruding parts of neighbouring pipe bundles, it is recommended to use load platforms with protecting covers.

4.1.9 When attaching pipe bundles to loading platform or deck from chromium and corrosion-resistant steels it is required to use nylon cables.

4.2 Handling operations

4.2.1 All handling operations with pipes shall be carried out with thread protectors screwed on pin and coupling ends.

4.2.2 Handling operations with pipe bundles shall be carried out only with the help of hoisting transportation clamps.

In case of manual unloading, rope slings shall be used and pipes shall be rolled along guides in parallel to the pile, avoiding quick movement and collision of pipe ends that might result in pipe and coupling thread damage even with protectors in place.

When using the crane, spreader beams with slings shall be used according to approved slinging diagrams.

4.2.3 Pipes shall not be allowed to fall down from heights or be picked up by the upper pipe end in a bundle with a hook or be dragged or subjected to any other actions that might damage pin and coupling threads, surfaces or shapes.

4.2.4 Handling operations with chromium steel pipes shall be performed using nylon or steel harnesses with plastic braid. When using a forklift, gripping forks, frames and clamps with non-metallic coating shall be used.

4.2.5 Handling operations for chromium steel pipes shall exclude collision with hard bodies having sharp edges that can result in sufficient local increase of pipe surfaces hardness and affect the sulphide stress cracking resistance.

4.3 Stockholding and storage

4.3.1 Pipes storage conditions shall correspond to GOST 15150 for group 4 (storage duration is 2 years). If pipes are stored for more than 2 years, reconservation shall be performed using conservation compound (Kendex OCTG or analogous compound) or thread compound with conservation properties.

4.3.2 Pipes stockholding shall be performed in compliance with Materials, Equipment and Spare Parts Stockholding and Storage Guidelines at production and technical maintenance facilities ensuring their preservation and avoiding damage of external and internal threads, surfaces or shapes.

4.3.3 Pipe bundles shall be stacked on supports spaced in a manner avoiding sagging or thread damage. Rack supports shall be located in one plane and shall not sag under the pile weight. Rack bearing surface shall be minimum 11.8110 inch above the ground or floor.

Pipe bundles shall not be stocked on the ground, rails,

steel or concrete floor!

There shall be no stones, sand, dirt on racks!

4.3.4 When several pipes bundles are stacked or not bundled pipes are stacked into several ranks, pipe bundles and pipe ranks shall be separated by at least three wooden blocks, with the thickness from 3780 to 1.5748 inch each, so that weight of upper pipe ranks is not distributed onto couplings of lower ranks.

The height of the pipe pile shall not exceed 9.8425 ft.

4.3.5 Stockholding of unbundled pipes is allowed provided vertical posts are installed in the racks.

4.3.6 If pipes are rolled on the racks, any movements at an angle to the rack axis shall be excluded as this may result in collision of pins and damage of thread or thread protectors.

4.3.7 During pipe storage, availability and integrity of thread protectors, as well as compound underneath shall be inspected. Pipe corrosion shall not be allowed.

4.3.8 Pipes damaged during transportation, rejected during inspection, prepared for repair or awaiting a final decision shall be stored on separate racks with the corresponding tags.

4.3.9 During storage of chromium steel pipes, wood or plastic gaskets shall be placed onto all pipe supports.

4.3.10 Drilling site shall have a special area for pipe stockholding in compliance with above-listed requirements.

4.3.11 Required quantity of racks shall be installed at drilling site in order to provide for stockholding of full set of pipes.

While stacking onto racks it is important to consider the order of string running (if it is specified in the work instruction) to be sure that the first pipe according to the work plan is not under the pipes that shall be run later. Pipes shall be placed onto racks in such a way so that to ensure couplings are facing the wellhead.

5 Preparation of pipes for make-up

5.1 General provisions

Prior to lifting the pipes onto the rig site, proceed as follows:

- Perform visual inspection of pipes and couplings;
- Remove thread protectors from pipes and couplings;
- Inspect pin and coupling surfaces;
- Drift pipes along the entire length;
- Measure the length of each pipe;
- Re-install clean thread protectors on pins and couplings.

5.2 Visual inspection

Visual inspection of pipes, couplings and thread protectors shall be performed in order to detect pipes form deviation, dents and damages.

Visual inspection of pipes and couplings shall be carried out with protectors screwed on.

Pipes, couplings, thread protectors with significant damages, discovered during visual inspection shall be put aside awaiting decision on their suitability for use.

Amount of damaged pipes shall be specified in the Product Quality Non-conformity Protocol and all damaged areas shall be documented on photographs.

5.3 Thread protectors removal

Thread protectors shall be removed after thread connections are visually inspected.

Thread protectors shall be removed manually or using a special tong with one person's effort. In case of difficulties when removing thread protectors, heating of thread protectors with steam is allowed as well as striking slightly with a wooden hammer at a protector end to eliminate a possible distortion.

5.4 Thread connection inspection

Thread connection shall be inspected by the following specialists:

– Crews for casing strings assembly;

– Companies specialized in casing inspection.

When running casing for the first time, representatives of the casing supplier shall be present.

An example of appearance of thread connection with GW compound on pin and coupling is provided in Figures 1 and 2.

When inspecting pin and coupling connections, including thread surface, thread seals and shoulders make sure you pay due attention to the following:

– Mechanical damages;

– Corrosion or other chemical damages caused as a result of environmental exposure.

Types and methods of damages repair are specified in Annex B.

Under low light condition (twilight, night) individual portable light source shall be used during inspection.

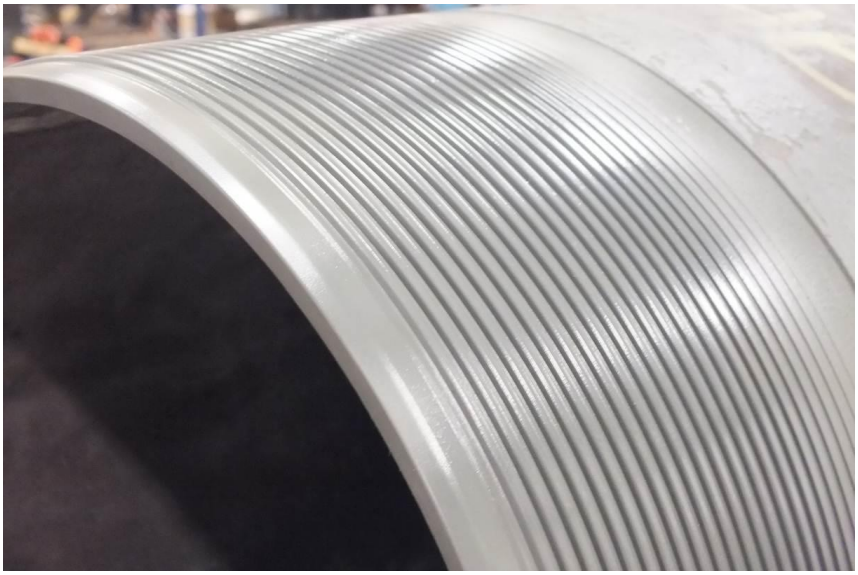

Figure 1 – Pin

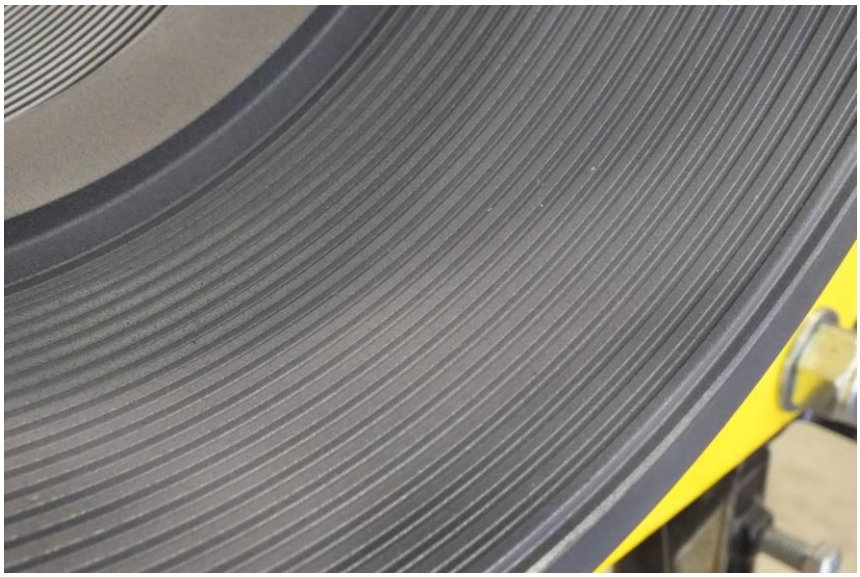

Figure 2 – Coupling

5.5 Drifting

Drifting shall be performed using a mandrel along the entire length of pipes. For drifting of pipes made of chromium and corrosion-resistant steels, polymer or aluminium mandrels shall be used.

Before drifting, the pipe shall be positioned in such a manner as to avoid sagging. If any ropes or bars are used for the drifting process, they shall be clean. In case of freezing temperatures pipes shall be heated prior to drifting, to remove snow and ice crust.

Pipe and drift shall be of the same temperature during drifting process.

Dimensions of the mandrel effective part shall comply with parameters specified in Table 1.

The mandrel shall pass through the entire pipe, when pulled manually without significant effort.

If a mandrel does not pass, such a pipe shall be replaced and specified in the Product Quality Non-conformity Protocol.

Pipes rejected during drifting process, shall be put aside until further decision on their validity.

Table 1 – Dimensions of the effective part of the mandrel

Pipe outside diameter, inch	Length of the effective part of the mandrel, inch	Diameter of the effective part of the mandrel, inch
up to 8 5/8 incl.	5.9843	d – 0.1252
over 9 5/8 to 13 3/8 incl.	12.0079	d – 0.1563
Note – d is a nominal pipe inside diameter.		

5.6 Measurement of length of pipes

Length of each pipe shall be measured from free (without a thread protector) coupling end face to free (without a thread protector) pin end face.

It is recommended to compare measured pipe length with the marked length. In case of discrepancies the measured length shall be marked on the pipe body with a marker or a chalk.

When calculating the total length of the string, one should use the formula specified below

$$L = \sum L_{\phi} - n\,\Delta L \qquad (1)$$

where L – the total length of the string;

$\sum L_{\phi}$ – the overall length of pipes in a string, measured from pin end face to free coupling end face;

n – number of pipes in a string;

ΔL – decrease of pipes length during make-up (ref. Table 2).

Table 2 – Decrease of pipes length during make-up process

In inches

Pipe outside diameter	Decrease of pipe length during make-up ΔL
4 1/2	4.2559
5	4.2795
5 1/2	4.3425
5 3/4	4.3622
6 5/8	4.5275
7	4.7480
7 5/8	4.9370
8 5/8	5.0591
9 5/8	5.1220
9 7/8	5.1220
10 3/4	5.1220
12 3/4	5.1850
13 3/8	5.1850

5.7 Thread protectors installation

Upon performance of inspection and control, thread protectors or caps shall be re-installed on pin and coupling ends.

Before installation thread protectors shall be thoroughly cleaned and have no significant damages affecting protection of thread and seal against direct contact with exposure.

6 Make-up of pipes

6.1 Running and pulling

6.1.1 Casing shall be assembled by a qualified operator. To ensure declared operational features of thread connection, make-up shall be performed with make-up torque registration system applicable.

If make-up torque registration system is not available then the following shall be used in priority-oriented order:

– Manometer of breakout tong (conversion of pressure into torque shall be in compliance with the tong manufacturer recommendations);

– Make-up triangle (cross stripe), para. 6.3.2.

6.1.2 A special bell guide is recommended for running and pulling operations (Figure 3). This device helps to align pin and coupling and prevent the connection from damage.

6.1.3 In order to decrease the risk of new damages during running and pulling operations, it is recommended to use pipe weight balancer.

In case of non-operating state of pipe weight balancer, it is required to coordinate actions of a hydraulic tong unit operator and a driller (in the process of make-up it is required to provide longitudinal compensation controlled by weight sensor on a hook).

6.1.4 While running string of chrome steel pipes it is recommended to use an elevator or special wedge claws to avoid pipe body damages.

Figure 3 – Make-up with special bell guide

6.1.5 Rotary tongs shall be equipped with a speed governor and ensure speed of 1-2 rpm at the final stage of make-up.

Tongs shall be equipped with clamps for specific pipe sizes to ensure a larger contact area with the pipe body. Clamps diameter shall be 1 % greater than pipe nominal outside diameter. Clamps shall be adjusted in such a way that they hold the pipe tightly and never slip.

For make-up and break-out of chromium steel pipes, the rotary tongs shall be equipped with non-metallic or non-injurious tong dies.

Prior to make-up, tongs shall be positioned as per Figure 4.

6.1.6 Make-up equipment shall ensure torque at least 30% greater than recommended maximum make-up torque.

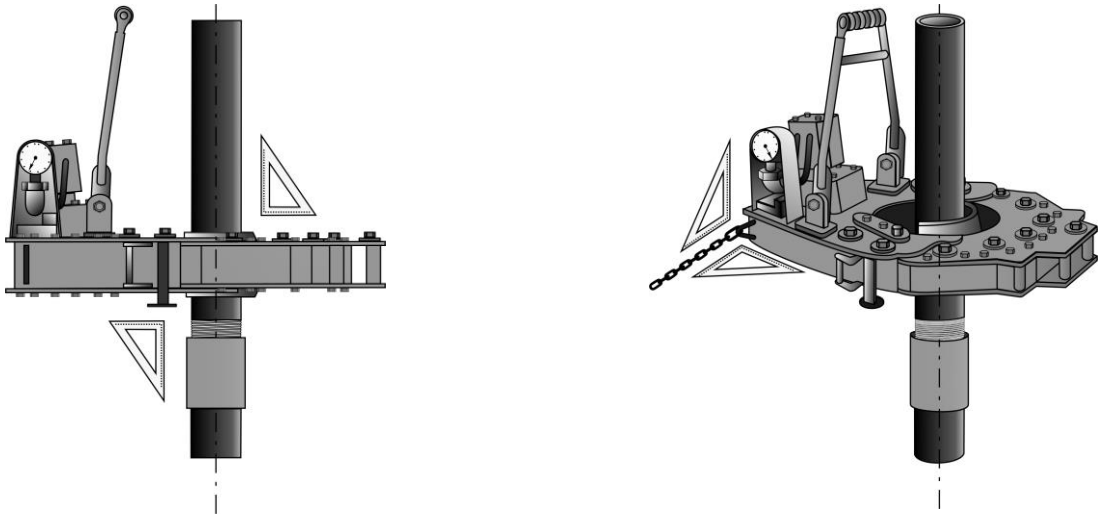

Figure 4 – Rotary tongs positioning before make-up

6.2 Assembly of string

6.2.1 Make sure thread protectors are secured in place prior to lifting pipes onto the rig floor.

Lifting pipes to the rig floor without thread protectors or end caps is not allowed!

6.2.2 Prior to assembly of the string, remove thread protectors and check by touch surfaces of thread seals and thread shoulders of the free pin for any mechanical damage, check for alignment of the assembled pipes (Figures 5 and 6).

During make-up process, if a derrick man is absent, it is required to control alignment of upper pipe coupling end (decline) with lower pipe rotation axis and correct the situation timely by directing a driller accordingly (topdrive turn, elevator movements up and down, etc.)

Maximum misalignment of connected pipes shall not exceed 0.7874 inch.

6.2.3 Prior to make-up, perform air blasting of external and internal threads and make sure, that surfaces of thread, thread seals and thread shoulders are free from mud or mud laden fluid with small contaminations, hindering tightness of connection. In case of mud or mud laden fluid on connection surfaces, clean them.

6.2.4 In case of combined make-up (one end of thread connection with GW compound is made-up with an end without compound), thread compound shall be applied according to Annex C.

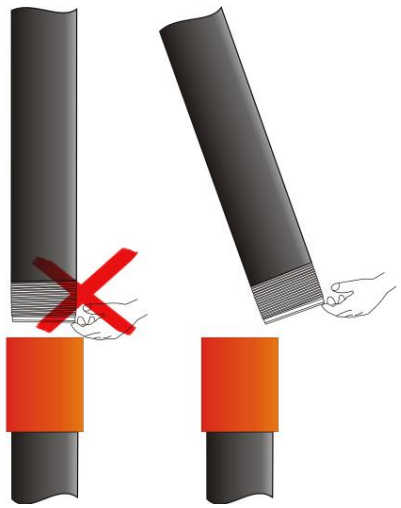

Figure 5 – Mechanical damages inspection

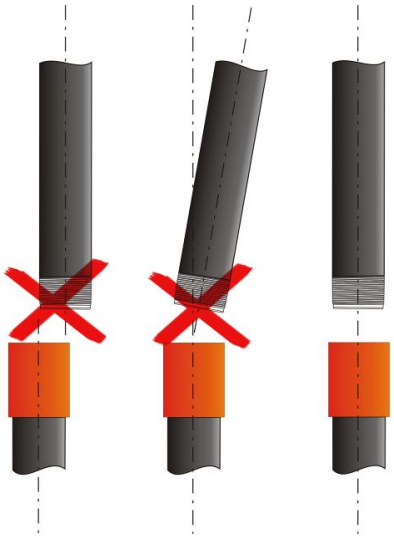

Figure 6 – Alignment inspection

6.2.4 When stabbing a pin into a coupling, pin end face shall not hit coupling end face, pin sliding down into the coupling is not allowed.

6.2.5 The make-up torque for a thread connection shall be within the range from the minimum up to the maximum torques for grades as specified in Table 3.

N o t e. The grades specified without types include all the types.

For grades not specified in Table 3, refer to the data provided in regulatory documentation for pipes.

If thread connection make-up with torque within the limits shown in Table 3 is not in compliance with specified requirements, *M*opt can be corrected but not more than by ±10 %. At that the values of M_{min} and M_{max} shall also be corrected but not more than by ±10 % of corrected M_{opt}.

Break-out may require higher torque than make-up.

Reduce of thread connection break-out torque by 25% relative to the recommended optimum make-up torque M_{opt} is allowed.

Table 3 – Make-up torques

D, Inch	*S*, Inch	Torque, ft lb for steel grades																										
		J55, K55			N80, L80			C90			R95, C95,T95			C110, P110			Q125			Q135			TMK140			TMK150		
		M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}
4 1/2	0.2500	3000	3300	3700	3800	4200	4600	4300	4700	5200	4400	4900	5500	5000	5500	6100	5300	5900	6500	5600	6200	6800	5900	6600	7200	6100	6800	7400
	0.2902	3500	3800	4200	4400	4900	5400	4900	5500	6000	5100	5700	6300	5800	6400	7100	6100	6800	7400	6400	7200	7900	6800	7500	8300	7100	7900	8700
	0.3370	4100	4500	4900	5100	5700	6300	5700	6300	7000	6000	6600	7300	6700	7400	8200	7200	8000	8800	7500	8300	9100	8000	8800	9700	8300	9100	10000
	0.4016	4800	5300	5800	6000	6700	7400	6700	7400	8200	7100	7900	8700	8000	8800	9700	8500	9400	10400	8900	9900	10800	9400	10500	11500	9700	10800	11900
5	0.2961	3700	4100	4600	4800	5300	5800	5200	5800	6400	5600	6200	6800	6300	6900	7600	6600	7400	8100	7000	7800	8600	7400	8200	9000	7700	8600	9400
	0.3618	4500	5000	5500	5800	6400	7100	6400	7200	7900	6700	7400	8200	7500	8300	9100	8100	9000	9900	8500	9400	10400	8900	9900	10800	9300	10300	11400
	0.4213	5200	5800	6400	6700	7400	8200	7400	8300	9100	7900	8800	9700	8800	9800	10800	9400	10500	11500	9900	11000	12100	10400	11600	12800	10800	12000	13200
5 1/2	0.2748	4100	4600	5000	5200	5800	6400	5800	6500	7200	6100	6800	7400	6900	7600	8300	7400	8200	9000	7700	8600	9500	8200	9100	10000	8500	9400	10400
	0.3039	4500	5000	5500	5800	6500	7200	6500	7200	8000	6900	7600	8300	7700	8600	9400	8200	9100	10000	8600	9600	10500	9000	10000	11100	9400	10500	11500
	0.3610	5400	6000	6600	7000	7700	8600	7700	8600	9400	8100	9000	9900	9000	10000	11100	9700	10800	11900	10300	11400	12500	10800	11900	13100	11100	12400	13600
	0.4150	6300	7100	7800	8000	8800	9700	8800	9800	10800	8800	9700	10700	9500	10500	11600	10100	11200	12300	11700	13000	14300	12300	13700	15100	12800	14200	15600
5 3/4	0.2756	4900	5500	6000	6300	7000	7700	6600	7300	8000	6900	7600	8300	7300	8100	8900	8300	9200	10200	8700	9700	10600	8800	9800	10800	9100	10200	11200
	0.3031	5200	5800	6400	6700	7400	8200	7100	7900	8700	7300	8100	8900	7800	8700	9600	8900	9900	10800	9300	10300	11400	9500	10500	11600	9700	10800	11900
	0.3346	5600	6200	6800	7200	8000	8800	7500	8300	9100	7800	8700	9600	8300	9200	10200	9500	10500	11600	9900	11000	12100	10100	11200	12300	10300	11500	12700
	0.3740	6000	6700	7400	7700	8600	9500	8100	9000	9900	8500	9400	10400	9000	10000	11000	10300	11400	12600	10700	11900	13100	10900	12100	13300	11200	12500	13700
	0.4213	6600	7300	8000	8500	9400	10400	8900	9900	10800	9200	10300	11300	9900	11000	12100	11200	12500	13700	11700	13000	14300	11900	13300	14600	12300	13600	15000
6 5/8	0.2882	4900	5500	6000	6300	7100	7700	7100	7900	8700	6900	7700	8500	7400	8200	9000	8500	9400	10300	9300	10300	11400	9000	10000	11000	9200	10300	11200
	0.3520	6300	7100	7800	8200	9100	10000	8600	9600	10500	8900	9900	10800	9500	10500	11600	10900	12100	13300	11400	12600	13900	11600	12800	14100	11800	13100	14500
	0.4169	7800	8700	9600	10000	11100	12200	10500	11700	12800	10900	12100	13300	11700	12900	14200	13300	14700	16200	13800	15300	16900	14100	15600	17200	14500	16200	17800
	0.4748	9100	10200	11200	11700	13000	14300	12300	13600	15000	12700	14100	15500	13600	15100	16700	15600	17300	19000	16200	17900	19700	16500	18400	20200	17000	18800	20700
7	0.3169	6700	7400	8200	8700	9700	10600	9100	10200	11200	9500	10500	11600	10100	11200	12300	11700	13000	14300	11900	13300	14600	12300	13600	15000	12600	14000	15400
	0.3618	7700	8600	9400	9700	10800	11900	10300	11400	12600	10700	11900	13100	11400	12600	13900	13000	14500	15900	13600	15000	16500	13800	15300	16900	14200	15700	17300
	0.4079	8500	9400	10400	10900	12100	13300	11400	12700	13900	11800	13100	14500	12600	14000	15400	14500	16100	17700	15000	16700	18400	15300	17000	18700	15800	17600	19300
	0.4531	9400	10400	11400	11900	13300	14600	12500	13900	15300	13000	14400	15900	13900	15400	17000	15900	17700	19500	16500	18400	20200	16900	18700	20600	17400	19300	21200
	0.4980	10300	11400	12500	13100	14500	16000	13700	15300	16800	14300	15900	17500	15200	16900	18600	17400	19300	21200	18100	20100	22100	18400	20400	22500	19000	21100	23200
	0.5402	11000	12200	13500	14100	15600	17200	14800	16400	18100	15300	17000	18700	16300	18100	20000	18800	20900	22900	19500	21600	23700	19800	22100	24300	20400	22700	25000
	0.5906	11900	13200	14500	15300	17000	18700	16000	17800	19500	16700	18500	20400	17600	19600	21600	20300	22600	24900	21000	23400	25700	21600	24000	26400	22100	24600	27000
7 5/8	0.3748	10000	11100	12200	12900	14300	15700	14300	15900	17500	15000	16700	18400	16900	18700	20600	18000	20000	22000	19000	21000	23200	19900	22100	24300	20600	22900	25200
	0.4299	11500	12800	14000	14700	16300	17900	16300	18100	19900	17200	19100	21000	19200	21300	23500	20500	22800	25100	21600	24000	26400	22800	25300	27800	23600	26300	28900
	0.5000	13300	14800	16300	17200	19100	21000	19000	21200	23300	20100	22300	24600	22500	25000	27500	24000	26700	29400	25200	28000	30800	26500	29500	32400	27600	30700	33800
	0.5949	15900	17700	19500	20400	22600	24900	22600	25100	27700	23800	26500	29100	26700	29600	32600	28500	31700	34900	29900	33200	36500	29900	33200	36500	29900	33200	36500

End of Table 3

D, Inch	*S*, Inch	Torque, ft lb for steel grades																										
		J55, K55			N80, L80			C90			R95, C95,T95			C110, P110			Q125			Q135			TMK140			TMK150		
		M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}
8 5/8	0.3520	12300	13700	15100	15900	17600	19400	17600	19500	21500	18500	20600	22600	20700	23000	25300	22200	24600	27100	23300	25900	28500	24600	27300	30000	25500	28300	31100
	0.4000	14000	15600	17100	18000	20000	22000	19900	22100	24300	21000	23400	25700	23500	26100	28700	25100	27900	30700	26400	29400	32300	27800	30900	34000	28900	32200	35400
	0.4500	15800	17600	19300	20300	22500	24800	22400	24900	27400	23600	26300	28900	26500	29400	32400	28300	31500	34700	29700	33000	36400	29900	33200	36500	29900	33200	36500
	0.5000	17600	19500	21400	22500	25000	27500	24900	27700	30500	26300	29200	32200	29400	32700	35900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5571	19500	21700	23800	24900	27700	30500	27700	30800	33900	29200	32400	35700	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
9 5/8	0.3520	14700	16400	18000	19000	21000	23200	20900	23300	25700	22100	24600	27000	24800	27500	30200	26500	29400	32400	27800	30900	34000	29300	32500	35800	29900	33200	36500
	0.3949	16600	18400	20300	21200	23600	26000	23600	26200	28800	24900	27600	30300	27800	30900	34000	29700	33000	36400	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4350	18300	20300	22300	23500	26000	28600	26000	28900	31800	27500	30500	33600	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4720	19800	22000	24200	25400	28200	31000	28200	31300	34400	29600	33000	36300	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5449	22900	25400	27900	29300	32500	35800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5949	24900	27600	30300	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6260	26300	29200	32200	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
9 7/8	0.6252	24300	26900	29600	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6610	25600	28500	31300	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.7201	27900	31000	34100	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
10 3/4	0.3500	22100	24500	26900	22800	25300	27800	23100	25700	28200	23200	25800	28400	23600	26300	28900	24100	26800	29400	24300	27100	29800	24600	27300	30000	24900	27600	30300
	0.4000	24000	26600	29300	24700	27400	30200	24900	27700	30500	25100	27900	30700	25600	28400	31300	26000	28900	31800	26300	29200	32200	26400	29400	32300	26800	29700	32700
	0.4500	26000	28800	31700	26500	29500	32400	26900	29900	32900	27000	30000	33000	27500	30500	33600	27900	31000	34100	28200	31300	34500	28300	31500	34700	28600	31800	35000
	0.4949	27600	30700	33800	28300	31500	34700	28600	31800	35000	28800	31900	35100	29200	32400	35700	29600	33000	36300	29900	33200	36500	29900	33200	36500	29900	33200	36500
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	0.5949	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6720	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
12 3/4	0.3740	24900	27700	30500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4331	28900	32100	35300	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4882	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5512	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
13 3/8	0.3799	27700	30800	33900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4299	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4799	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5142	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500

N o t e. Make-up with special couplings shall be performed using torques 20% less than the specified ones.

6.2.6 During make up of pins and couplings (or equipment) made of steels of different grades, the make-up torque value shall be chosen according to the lowest steel grade.

6.2.7 The first two turns shall be carried out manually, or a strap tong can be used (Figure 7). Chain tong is allowed for use only provided that the pipe body is secured from damage (e.g. by the safe gasket which is set between the pipe body and the tong).

Figure 7 – Make-up start with strap tongs

6.2.8 Speed of thread connection make-up by rotary tong shall correspond to the speed, specified in Table 4.

Table 4 – Rotation speed during make-up

Start of make-up		End of make-up (rotation on shoulder)
First two turns	**Further turns**	
Speed maximum 2 rpm, Better manually	Speed maximum 10 rpm	Speed maximum 2 rpm

6.2.9 Even longitudinal movement of the pipe resulting from gradual increase of number of engaged revolutions, shall be watched, significant warming of the connection (not more than 122^0F of the ambient temperature) shall not be allowed.

6.2.10 Make-up shall not cause significant mechanical damages like galling, jamming or other imperfections on pipe and coupling body.

The outer surface of coupling shall be free of damages with the depth larger than 0.5% of the coupling nominal outside diameter.

Damages from tong clamps are allowed on the pipe outer surface provided that the actual pipe wall thickness, taking into account depth of the damage, shall be not less than 87.5% of the nominal pipe wall thickness.

After make-up of chromium steel pipes the mark on the pipe body shall not be deeper than 0.0079 inch.

6.2.11 At the initial stage of assembling it is recommended to perform the first two revolutions of pipe using strap tongs (chain tongs are allowed for use only with the safe gasket which is set between the pipe body and the tong thus avoiding pipe body damage) to assure connection of external and internal threads, i.e. entering of external thread profile in mating profile of internal thread. At this stage pipe reversal half-revolution is allowed for steady continuation of make-up without threads overlapping and high-quality assembly.

6.2.12 When using hydrotongs with back app, the following conditions shall be observed:

During the first rotations (better manually, using a chain tong), back app shall be opened, and make-up shall be performed without make-up torque increase. At that it is possible to make horizontal movements of hydrotong (right/left) to prevent thread bite during make-up.

Upon increase of make-up torque (on the last 3 turns), it is required to stop, fix the back app on lower pipe body and continue make-up.

6.2.13 When the value of the final make-up torque equal to M_{max} value is achieved, turning of coupling from the side of mill connection is allowed, if the make-up diagram has not been changed (Figure 8). The final make-up torque values shall be within M_{min} to M_{opt} limits in order to reduce the probability of turning.

6.3 Make-up inspection

6.3.1 Make-up inspection by the make-up diagram

6.3.1.1 If the make-up is performed correctly and all the thread connection geometric parameters comply with the requirements of the regulatory documentation, the make-up diagram will show defined areas, which correspond to torque increase upon thread surfaces mating (area I), and the further mating of thread seals and thread shoulders (area II and area III), as shown in the Figure 8 below.

6.3.1.2 The rotary torque increase on the first revolutions, corresponding to the initial mating of thread surfaces shall be smooth and even. Further on with mating of thread surfaces and thread seals, acceleration of rotary torque shall increase till shouldering of the connection which shall be accompanied with the sharp increase in torque. Value of torque increase from the moment of the connection shouldering shall be at least 1000 Nm per 0.015 of rotation.

6.3.1.3 Depending on the rotary tong used, its adjustment and other factors, the make-up diagram (especially in area I) can show areas with insignificant deviations from the straight line: oscillations, leaps, etc. Such deviations shall be deemed acceptable, provided that peak values do not exceed the shoulder torque M_{sh} value, and it is possible to track areas of mating of thread surfaces, seals and shoulders on the diagram.

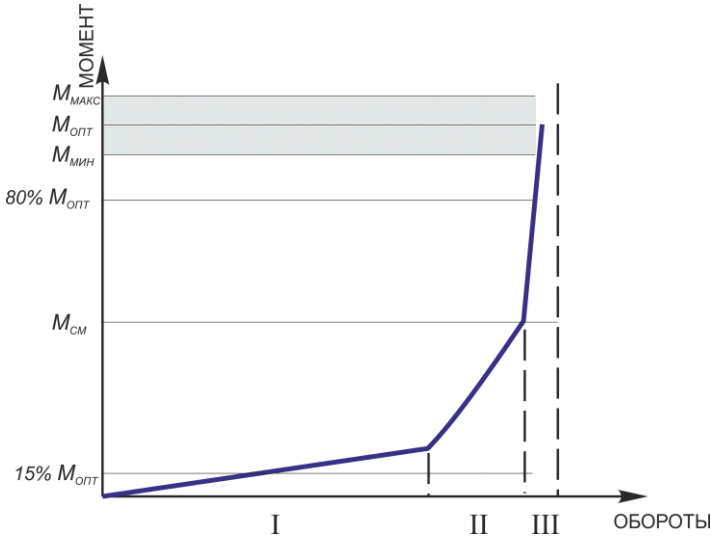


Figure 8 – Thread connection make-up diagram

6.3.2 Within the same purchase order the make-up diagrams for each pin and coupling shall be as close as possible by shape.

6.3.3 The shoulder torque M_{sh} of thread shoulders (box shoulder and pin shoulder) shall be within the range between 15 % and 80 % of the optimum make-up torque M_{opt}.

6.3.4 The final make-up torque shall be within the range from the minimum M_{min} to the maximum M_{max}.

6.3.5 Typical cases of make-up diagram shape non-compliance are shown in Figures 9–13.

6.3.6 If the torque make-up increase stops and a horizontal section appears during the final make-up stage (section IV, Figure 9), and there is no slippage of the clamp jaws, the connection shall be broken out and thread surface, thread shoulders and thread seals of pin and coupling shall be visually inspected. If during inspection, no damages and shape distortion such as decrease of pin or box shoulder inside diameter, sagging on coupling inside surface are observed, or damages, that can be repaired (Table 2), are observed, re-assembly of the connection can be performed upon elimination of all the damages.

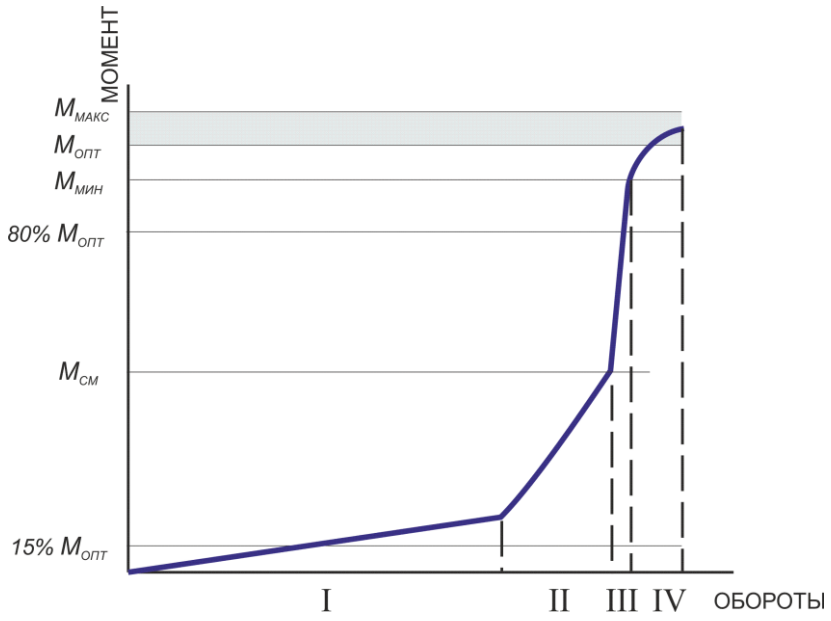


Figure 9 – Make-up diagram. Torque increase stopped

6.3.7 Too low value of shoulder torque M_{sh} (below 15% M_{opt}) on the make-up diagram (Figure 10) may result from:

- Unfavorable combination of technological parameters of mating connection;
- Contamination of thread and/or thread seals;

6.3.7.1 Break-out the connection, inspect it, clean if necessary and repeat make-up.

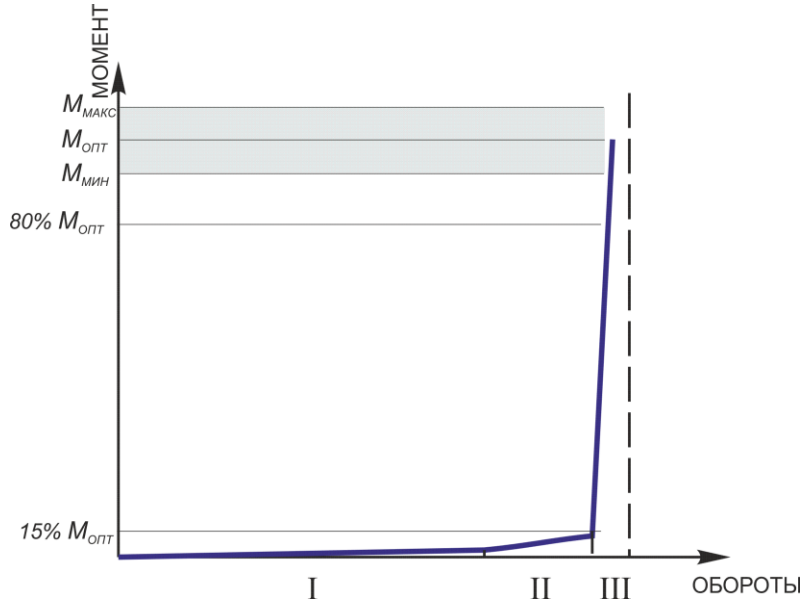


Figure 10 – Make-up diagram. Low value of shoulder torque of thread shoulders

6.3.8 Too high value of shoulder torque M_{sh} (over 80% of M_{opt}) on the make-up diagram (Figure 11) may result from:

- Damage of thread and/or thread seals;
- Improper thread cleaning;
- Unfavorable combination of technological parameters of the connection.

6.3.8.1 Break-out the connection, inspect it, clean if necessary and repeat make-up.

6.3.7.2 If the shape of the make-up diagram after re-make-up has not changed, the pipe shall be laid aside and make-up with another pipe shall be performed. The pipe that was laid aside is allowed to be used for further make-ups if no damages, or damages that can be repaired, are observed (Annex B). After the damages are repaired, the setting of equipment shall be checked and make-up shall be repeated. If the shape of the make-up diagram, when being made-up with another pipe, has not changed, the connection shall be broken-out and the previous pipe shall be replaced.

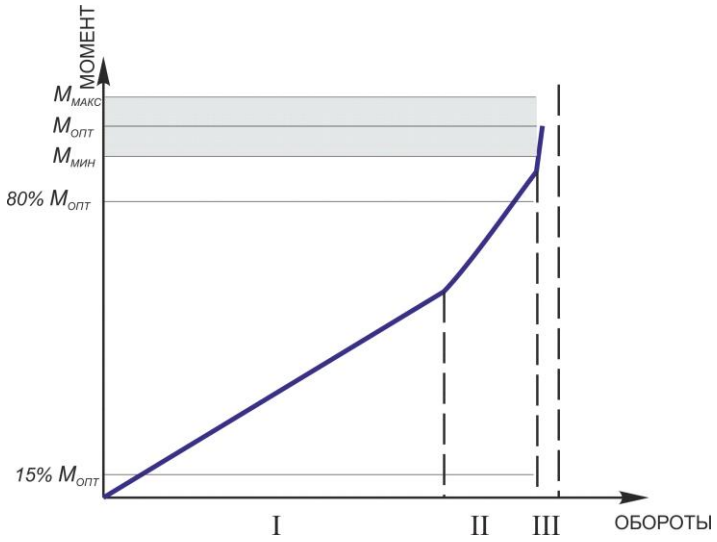


Figure 11 – Make-up diagram. High value of shoulder torque of thread shoulders

6.3.9 Torque leaps on the make-up diagram (Figure 12) may result from:

- Contamination of thread and/or thread seals;
- Damage of thread and/or thread seals;
- Rotary tong jam;
- Uneven force of rotation on shoulder.

6.3.9.1 Such a diagram is considered good and may be accepted provided that requirements specified in para. 6.3.1.3 are met.

Otherwise break-out the connection, inspect it, clean if necessary, check tongs placement, alignment of made-up pipes, make sure there is no slippage of clamp jaws and make-up the connection again.

6.3.9.2 If the shape of the make-up diagram after re-make-up has not changed, the pipe shall be laid aside and make-up with another pipe shall be performed. The pipe that was laid aside is allowed to be used for further make-ups if no damages, or damages that can be repaired, are ob-

served (Annex B). After the damages are repaired, the setting of equipment shall be checked and make-up shall be repeated.

If the shape of the make-up diagram, when being made-up with another pipe, has not changed, the connection shall be broken-out and the previous pipe shall be replaced.

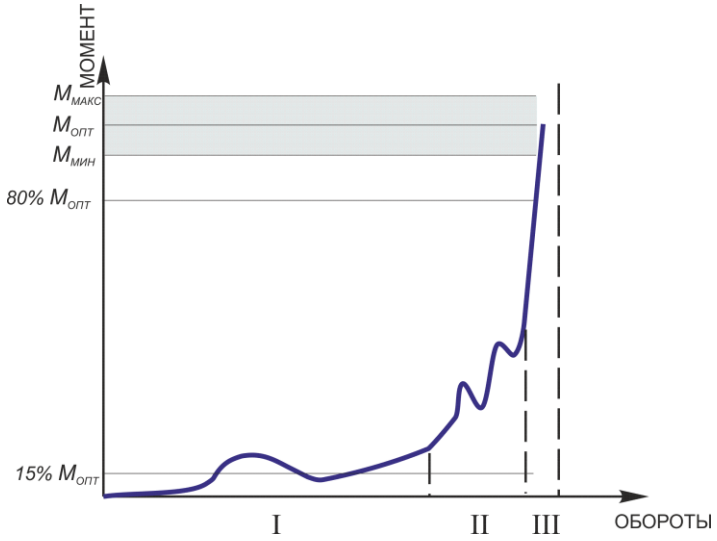


Figure 12 – Make-up diagram. Torque leaps

6.3.10 Make-up curve with a wave-like effect (Figure 13), may result from:

- Improper thread cleaning;
- Contamination of thread and/or thread seals.

6.3.10.1 Such a diagram is considered good and may be accepted provided that requirements specified in para. 6.3.1.3 are met.

Break-out the connection, inspect it, clean if necessary and inspect for damages. If there are no damages, make-up the connection again.

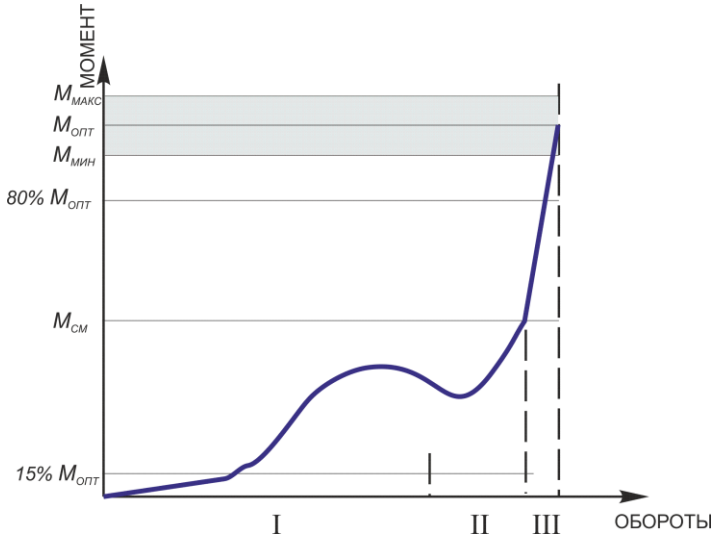


Figure 13– Make-up diagram. Wave-like effect

6.3.11 Any time the make-up curve is of improper shape, giving rise to doubt in make-up quality, break out the connection. Surfaces of internal and external threads shall be inspected and cleaned if necessary. If during visual inspection no damages or damages that can be repaired were found (Annex B), after the damages are repaired, check the equipment setting and repeat make-up. If the result of make-up is the same as the first time, the pipe shall be laid aside and used for one of subsequent make-ups. If the results of make-up with another pipe are unsatisfactory, this pipe shall be rejected.

6.4 Break-out of string

6.4.1 When the string is being pulled out of the well, pin end face is not allowed to hit against coupling end face.

6.4.2 Even longitudinal movement of the pipe resulted from gradual decrease of number of engaged turns, shall be watched when the connection is broken-out.

6.4.3 Prior to break-out, the rotary tong shall be positioned as per Figure 6.

6.4.4 Break-out torque shall provide for the connection disassembly.

6.4.5 Speed of thread connection break-out by rotary tong shall correspond to the speed, specified in Table 5.

Table 5 – Speed of thread connection break-out

Start of break-out		End of break-out
First two turns	Further turns	
Speed maximum 2 rpm,	Speed maximum 10 rpm	Speed maximum 2 rpm

6.4.6 Break-out shall not cause significant mechanical damages like galling, jamming or other imperfections on pipe and coupling body.

The outer surface of coupling shall be free of damages with the depth larger than 0.5% of the coupling nominal outside diameter.

Damages from tong clamps are allowed on the pipe outer surface provided that the actual pipe wall thickness, taking into account depth of the damage, shall be not less than 87.5% of the nominal pipe wall thickness.

After break-out of chromium and corrosion-resistant steel pipes the mark on the pipe body shall not be deeper than 0.0079 inch.

6.4.7 When the string is disassembled, immediately after break-out thread protective elements shall be installed on pin and coupling ends.

6.4.8 To store used pipes after string disassembly, if necessary, following preparations shall be carried out:

– Visual inspection of thread protectors for damages;

– Visual inspection of pipes and couplings for significant mechanical damages (like galling, jamming etc.);

– Visual inspection of thread, thread seals and thread shoulders surfaces of pins and couplings;

– Application of conservation compound (Kendex OCTG or analogous compound) or thread compound with conservation properties. After compound application install thread protectors according to para. 5.8.

6.4.9 In case of any damages detection, in compliance with Annex B, repair shall be done, or pipes and couplings shall be rejected;

6.4.10 GW compound delamination is allowed on pin and coupling surface if it is not more than 20% from coated surface with possibility of further use. An example of appearance of thread connection with GW compound on pin and coupling after string disassembly is provided in Figures 18 and 19.

Figure 18 – Pin

Figure 19 – Coupling

6.4.11 If compound delamination exceeds allowed value (para. 6.4.10) repair composition shall be applied according to Annex B.

7 Developer's warranty

Provided that the present recommendations are met, TMK UP FMC thread connection shall withstand at least 3 make-up and break-out cycles preserving the same technical characteristics.

Annex A

(mandatory)

Equipment for make-up registration

TMK UP FMC thread connection shall be made-up using equipment for make-up registration and saving of make-up diagram (make-up curve) in a graphical or electronic format.

The curve is plotted based on torque values along the vertical axis and number of turns along the horizontal axis which shall have a linear scale. Only two last revolutions shall be displayed as torque increases at the end of make-up.

When using a computer, a make-up diagram shall have the following characteristics:

– Sufficient resolution (at least 800×600 pixels) for precise curve profile display. Display shall be at least 9.8425 inch in diagonal, herewith make-up curve shall take at least 80 % of display;

– Display of minimum and maximum torque with horizontal lines (if required, optimum torque shall be displayed);

– Display of minimum and maximum shoulder torque of thread shoulders with horizontal lines;

– Automatic and manual determination of shoulder torque of thread shoulders;

– Display of rig floor number of each make-up;

– Display of date and time of each make-up;

– Availability of comments;

– Display of company-customer name, well number, pipe diameter, weight, steel grade, type of thread connection, thread compound data and pipe manufacturer;

– When applicable, superimposing of the latest make-up curve over the curves of previous satisfactory make-up diagrams;

– When applicable, display of make-up speed in rpm, either on the make-up curve or on a separate graph.

Acceptance or rejection of make-up operations shall not be based on displayed make-up results. Correctness of make-up shall be confirmed by a competent specialist.

Prior to running the casing downhole
the calibration certificate with the latest and next planned equipment
calibration dates shall be checked!

Annex B

(mandatory)

Types of damages and methods of repair

B.1 Possible damages that might occur on areas of thread surfaces, thread seals, thread shoulders of pin and coupling before putting into operation and methods of their removal are listed in Table 1.

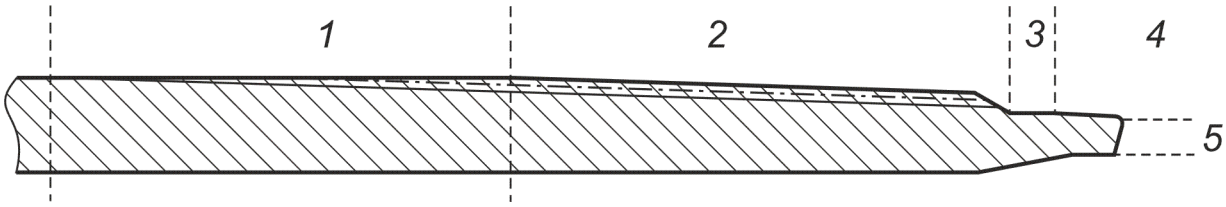
If any unacceptable damages are detected on pipes, such pipes shall be rejected then and reported accordingly specifying pipes serial numbers, describing defects found with photos attached.

Table B.1 – Types of damages and methods of repair

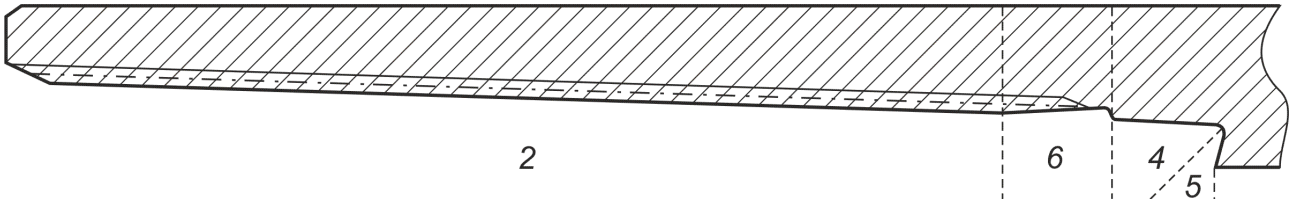
Surface area (Figure B.1)	Type of damage	Damage repair method
1, 2, 5	Pit corrosion less than 0.0039 inch deep, film of rust	Manual repair using non-metal brush with soft bristle or polishing paper with grain 0
	Pit corrosion more than 0.0039 inch deep	Not to be repaired
	Burrs less than 0.0118 inch wide Tears and scratches less than 0.0039 inch deep	Manual repair using needle file or polishing paper with grain 0
	Dents, nicks and other mechanical damages	Not to be repaired
	Corrosion marks	Removal using corrosion converters followed by dry cloth wiping
3.6	Pit corrosion less than 0.0118 inch deep, film of rust	Manual repair using a needle file or polishing paper
	Pit corrosion more than 0.0118 inch deep	Not to be repaired
	Burrs less than 0.0118 inch wide. Tears and scratches less than 0.0118 inch deep	Manual repair using needle file or polishing paper with grain 0
	Corrosion marks	Removal using corrosion converters followed by dry cloth wiping
4	Pit corrosion of any depth	Not to be repaired
	Film of rust	Manual repair using non-metal brush with soft bristle and corrosion converter or polishing paper with grain 0
	Burrs, tears and scratches	Not to be repaired
	Nicks	Not to be repaired
	Small grooves	Buffing
	Corrosion marks	Removal using corrosion converters followed by dry cloth wiping

B.2 Determination of corrosion depth, scratches, tears, burrs height shall be performed after removal of GW compound in the defect area:

– A mould taken from a detected defect using a special tape (X Coarse material of Testex company for defects up to 0.0039 inch deep, for deeper defects: X-Coarse Plus or equivalent one). Mould height shall be measured with a thickness gage, measurement accuracy shall be at least 0.0004 inch (PEACOCK G2-127 gage or equivalent one);



a) – Surface of external thread connection



b) – Surface of internal thread connection

1 – imperfect profile thread; 2 – perfect profile thread; 3 – cylinder groove; 4 – tapered thread seal; 5 – thread shoulder 6 – tapered bore;

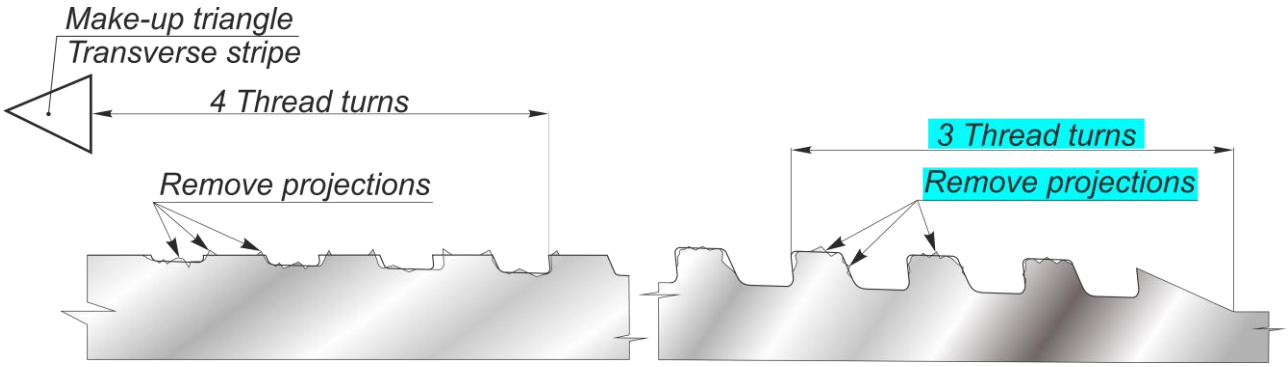
Figure B.1 – Surfaces of external and internal thread connection

– Depth gage with a needle-type contact point (contact point diameter shall be maximum 0.0039 inch), measurement accuracy shall be at least 0.0004 inch (PEACOCK T-4 gage or equivalent one).

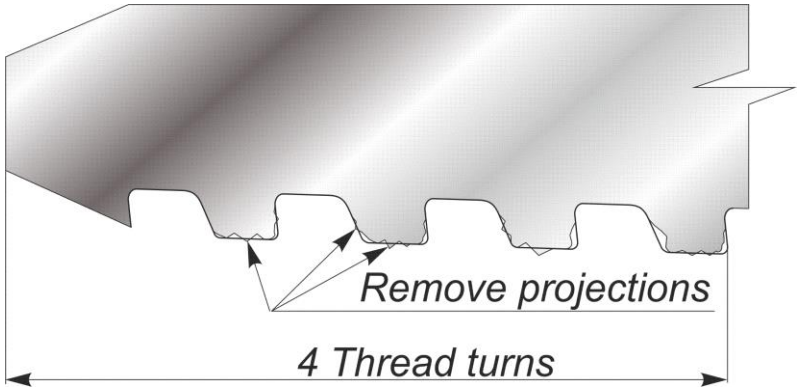
B.3 Possible types of damages of thread, thread seals and thread shoulders surfaces of pins and couplings during make-up, as well as repair methods are specified in Table 2.

Table B.2 – Types of damages and methods of repair

Surface area	Type of damage	Method of repair	Maximum time allowed for repair
4,5 (Figure B.1)	Any damages	Not to be repaired	-
1,2,3,5 Figure B.1	Severe damages	Not to be repaired	-
2,3 ,6 Figure B.1	Light damages	Manual repair. Use polishing paper with grain 100÷150 micron	10 min
1, 2 Figure 1; Figure 2 (a, b)	Moderate damages on a thread length maximum 4 turns	Manual repair. Use a needle file No.2, No.3, and polishing paper with grain 100÷150 micron for further treatment	10 min



a) – Surface of external thread connection



b) – Surface of internal thread connection

Figure B. 2 – Surfaces of external and internal thread connection

B.4 If after repair or break-out surface damages exceed 20% of GW compound surface area on pin or coupling, a uniform layer of RUSMA Polimer Premium R repair composition shall be applied on damaged areas using a brush.

B.5 If after repair or break-out surface damages exceed 20% of GW compound surface area on pin, a uniform layer of RUSMA Polimer Premium MDM repair composition shall be applied on damaged areas using a brush.

B.6 If less than 20% of GW compound surface area on pin or coupling is damaged, no repair of coating is required. Coating properties are provided by the rest of coating area.

If there is no repair composition, further use of pipes shall be performed only with recommended thread compound according to Annex C.

Annex C

(recommended)

Thread compound application

C.1 To ensure optimum conditions for make-up and to avoid burrs of mating surfaces, all surfaces of thread, thread seals and thread shoulders of pins and couplings shall be provided with thread compound. Thread compound shall comply with requirements specified in API RP 5A3/ISO 13678.

The following thread compounds are recommended:

- RUSMA-1, RUSMA-1(3);
- RUSMA-1i;
- RUSMA R-4 , RUSMA-4(3);
- RUSMA SP;
- Bestolife API Modified;
- JET-LUBE API Modified.

While making-up pipes of chromium steels it is recommended to use RUSMA-14 thread compound, and RUSMA R-24Cu Arctic thread compound in high north areas.

Upon coordination with the connection designer, other than mentioned thread compounds may be applied; if they comply with API RP 5A3/ISO 13678 requirements and provide for thread connection sealability, as well as for protection from galling and corrosion.

C.2 Thread compound for make-up shall only be taken from original packages, delivered by the supplier, the container shall show name, batch number and manufacturing date.

Compound from packages without proper identification shall never be used.

Compound shall never be placed in other packages or dissolved!

Compound applied shall be homogeneous, of ointment consistency, free from any solid inclusions (stones, sand, dry compound, fine chips, etc.).

Prior to use, check compound's expiration date on the package. Never apply compound with expired shelf life.

Make sure you follow the recommendations specified below when using thread compound:

– Use the same compound (the same type) when assembling one casing string;

– Use a new compound package for each running, if the compound from opened package is used, make sure it is free from foreign inclusions;

– Stir the compound thoroughly before use;

– Warm up compound before application in case of freezing temperatures.

Compound shall be stored in closed overturned packages at the temperature specified by the manufacturer. When storing partially unused compound, always specify the date of the first use on the package.

C.3 Thread compound shall be applied in an even layer on the whole thread surface, thread seals and thread shoulders of pins and couplings connections. Figures C.1 and C.2 demonstrate proper and improper application of thread compound.

Compound shall be applied only on thoroughly cleaned and dried surfaces of thread connection.

Never use metal brushes for compound application!

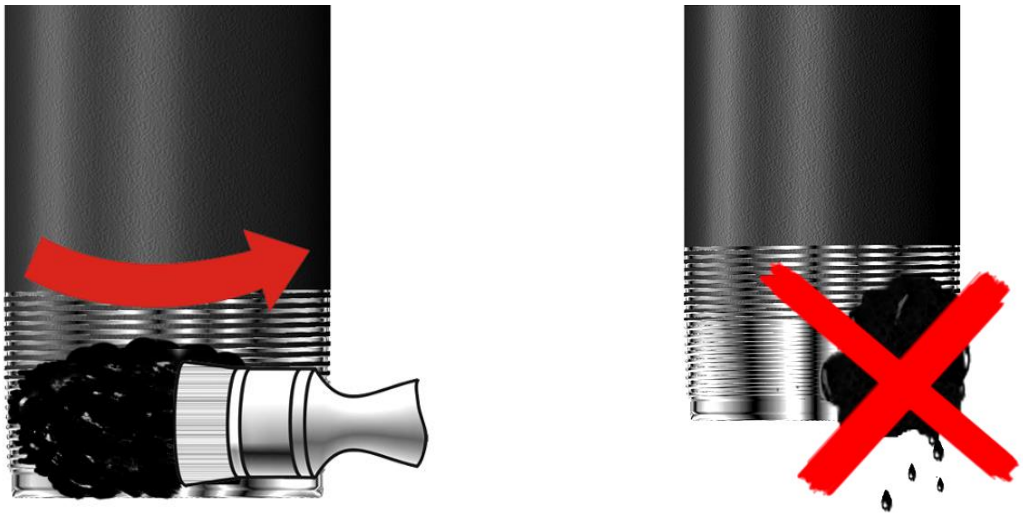


Figure C.1 – Proper and improper application of thread compound

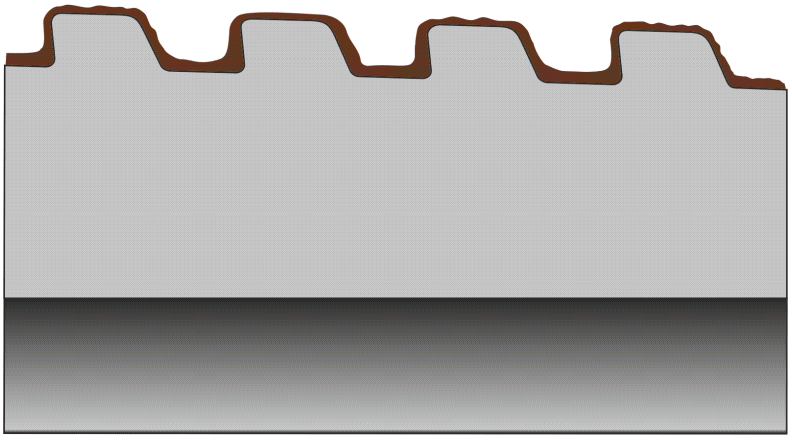


Figure C.2 – Proper distribution of thread compound over thread profile

C.4 Required amount of thread compound shall be distributed between coupling and pin ends as follows: two thirds shall be on the coupling end and one third shall be on the pin end.

The minimum and the maximum compound mass m_{min} and m_{max} in gr for make-up of one thread connection shall be calculated as follows:

$$m_{min} = 0{,}25 \times D \quad \text{(B.1)}$$

$$m_{max} = 0.3 \times D \quad \text{(B.2)}$$

where:

m_{min} is the minimum compound mass in gr rounded to an integral value;

m_{max} is the maximum compound mass in gr rounded to an integral value;

D is the nominal outside diameter of pipes, in mm, rounded to an integral value.

Example – The minimum quantity of thread compound required for make-up of one thread connection of pipes with an outside diameter of 114.30 mm (4 1/2 inch):

$$m_{min} = 0{,}25 \times 114 = 28{,}5 \approx 30,$$

at that at least 20 gr shall be applied on coupling end and at least 10 gr on pin.

To determine the quantity of compound required for determined number of pipes, a package of compound with specified volume shall be used.

Prior to pipes running down the hole, make sure that required thread compound is available.

C.5 Thread sealant can be used for make-up of pipes with crossovers or other string elements provided the below conditions are followed:

– Shoulder torque of thread shoulders is within the limits of minimum and maximum make-up torques;

– Shoulder torque of thread shoulders is from 70 % to 80 % of optimum make-up torque, and the torque of rotation on shoulder is higher than optimum make-up torque;

– Shoulder torque of thread shoulders is higher than 80 % of optimum make-up torque and it does not result from thread jamming or damage, and 20 % of optimum make-up torque is applied after the shoulders interlock.