PREMIUM SERVICE

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18 november 2016

Guidelines
For Use of Casing with
TMK UP PF ET Thread Connection with GW Compound

RE PS 05-004-2015

Revision 2

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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.

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

Effective date 25 – 12 – 2016

1 Scope

The present guidelines contain recommendations for maintenance and use of casing with TMK UP PF ET 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 0254-001-46977243-02 RUSMA-1 Thread Compound;

TU 0254-031-46977243-04 RUSMA P-4 Thread Compound;

TU 0254-068-46977243-2011 RUSMA P-14i 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 in 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 pipe 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 – 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 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 forklift, gripping forks, frames and clamps with nonmetallic 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 pin and coupling 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 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, and dirt on racks!

4.3.4 When several pipe 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 – 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 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 effort. In case of difficulties when removing thread protectors, heating of thread protectors with steam is allowed or striking slightly with a wooden hammer at a protector‘s 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.

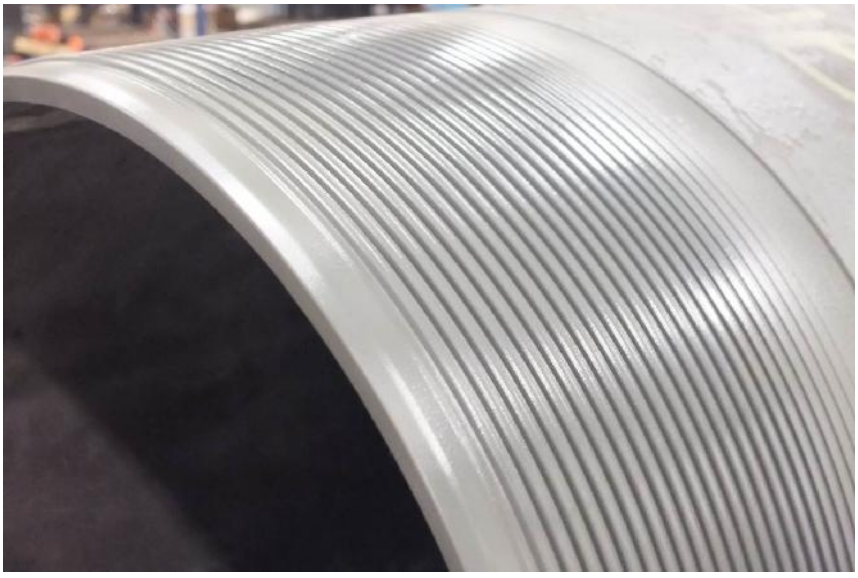

Figure 1 – Pin

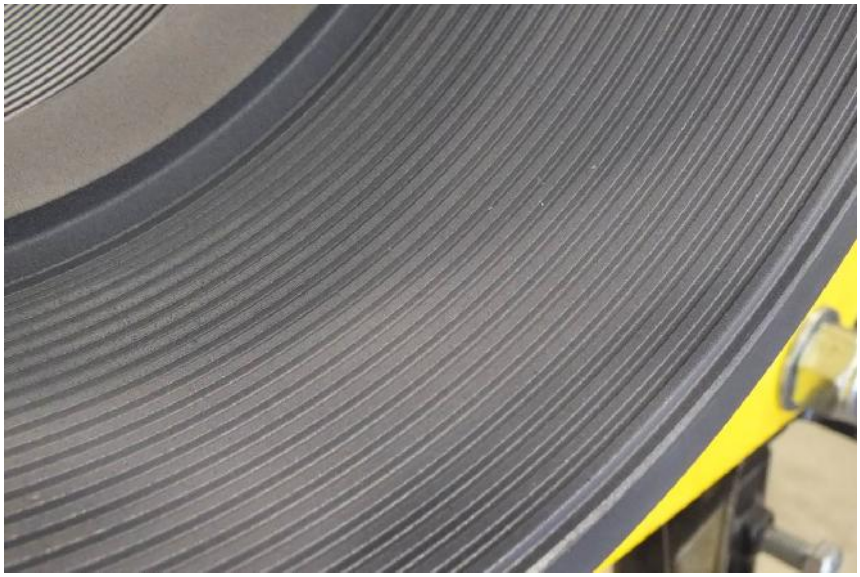

Figure 2 – Coupling

5.5 Drifting

Pipes should be checked by drift along the entire length of the pipe. For pipes made of chromium and corrosion-resistant steels polymer or aluminium drifts 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 drift effective part shall comply with parameters specified in Table 1. Diameter of the drift effective part shall be checked in three planes after each 50 pipes check. If the diameter decreases by more than 0.0197 inch in any of the three planes, such a drift shall be rejected.

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

If a drift 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 drift

Pipe outside diameter, inch	Length of the effective part of the drift, inch	Diameter of the effective part of the drift, inch
up to 8 5/8 incl.	5.9843	d – 1/8
9 5/8 to 13 3/8 incl.	12.0079	d – 5/32
13 5/8	12.0079	d – 3/16
N o t e – *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 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 pipe body with a marker or chalk.

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

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

where L – the total length of the string;

$\sum L_{ф}$ – 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 length of pipes during make-up (ref. Table 2).

Table 2 – Decreasing of pipe length during make-up process

In inches

Pipe outside diameter	Decrease of pipe length during make-up Δ*L*
4 1/2	4,0787
5	4,2008
5 1/2	4,2638
6 5/8	4,4843
7	4,6732
7 5/8	4,9134
8 5/8	5,0394
9 5/8	5,0394
9 7/8	5,1024
10 3/4	5,0787
11 3/4	5,1417
11 7/8	5,1417
12 3/4	5,1417
13 3/8	5,0787
13 5/8	5,1417

5.7 Thread protectors installation

Upon performance of inspection and control, thread protectors or caps shall be re-installed on pin and couplings 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 in compliance with the tong manufacturer recommendations);

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

6.2.1 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 risk of new damages during running and pulling operations, it is recommended to use pipe weight balancer.

6.1.4 While running string of chrome steel pipes it is recommended to use 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 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. Clamp diameter shall be 1 % greater than pipe 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-metal 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. Breaking-off requires higher torque than make-up.

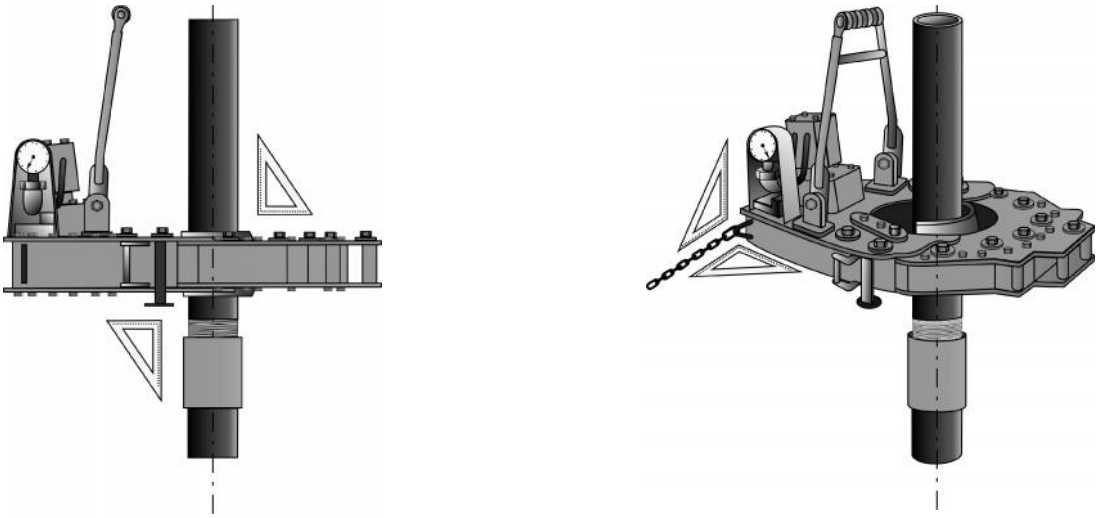

Figure 4 – Rotary tongs positioning before make-up

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).

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.

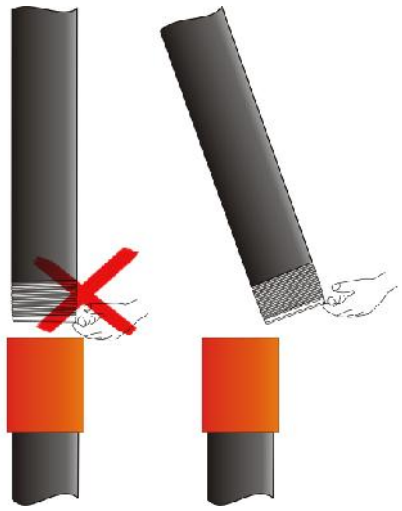

Figure 5 – Mechanical damage inspection

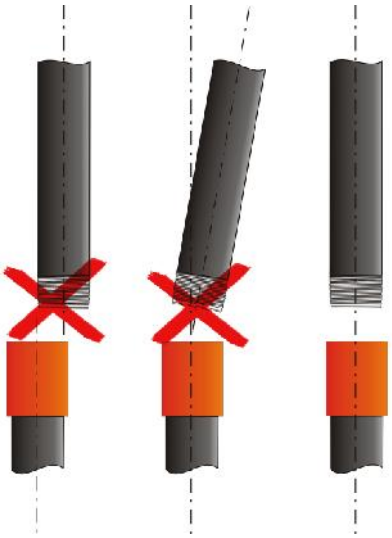

Figure 6 – Alignment inspection

6.2.4 When stabbing pin into coupling, pin end-face shall not hit coupling end-face, and pin sliding down into the coupling when pin end-face contacts coupling end-face is not allowed.

6.2.5 Make-up shall be performed with the torque specified in Table 3.

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 be corrected but not more than by ±10 % from corrected M_{opt}.

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	3800	4200	4600	4800	5300	5800	5600	6200	6800	5600	6200	6800	6000	6600	7300	6600	7300	8000	7100	7900	8700	7400	8300	9100	7700	8600	9400
	0,2902	4400	4900	5400	5600	6200	6800	6400	7200	7900	6400	7200	7900	7000	7700	8600	7700	8600	9400	8200	9100	10000	8600	9600	10500	8900	9900	10800
	0,3370	4600	5200	5700	6100	6800	7400	7000	7700	8600	7000	7700	8600	7600	8400	9200	8400	9400	10300	9000	10000	11000	9500	10500	11600	9900	11000	12100
5	0,2961	4900	5400	5900	6000	6700	7400	6500	7200	8000	6500	7200	8000	7300	8100	8900	8000	8900	9800	8900	9900	10800	9400	10500	11500	9700	10800	11900
	0,3618	5900	6600	7200	7400	8200	9000	8000	8800	9700	8000	8800	9700	9000	10000	11000	9900	11000	12100	10800	12000	13200	11500	12800	14000	11900	13200	14500
	0,4370	6800	7500	8300	8500	9400	10400	9700	10800	11900	9700	10800	11900	10700	11900	13100	11900	13300	14600	12500	13900	15300	13100	14600	16100	13600	15200	16700
	0,4780	7400	8200	9000	9400	10400	11400	10600	11800	13000	10600	11800	13000	11700	13000	14300	13100	14500	16000	13700	15300	16800	14500	16100	17700	15000	16700	18400
	0,5000	7700	8600	9500	9700	10800	11900	11000	12200	13500	11000	12200	13500	12300	13600	15000	13700	15300	16800	14400	16000	17600	15200	16900	18600	15800	17600	19300
5 1/2	0,2748	5100	5700	6300	6300	7000	7700	7000	7800	8600	7000	7800	8600	7900	8800	9700	8700	9700	10600	9200	10300	11300	9700	10800	11900	10100	11200	12300
	0,3039	5700	6300	7000	7000	7700	8600	7700	8600	9500	7700	8600	9500	8700	9700	10600	9600	10600	11700	10300	11400	12500	10800	11900	13100	11100	12400	13600
	0,3610	6500	7200	8000	7600	8400	9200	8600	9600	10500	8600	9600	10500	10100	11200	12300	11100	12400	13600	11100	12400	13600	11700	13100	14400	12200	13600	14900
	0,4150	7500	8300	9100	8700	9700	10600	9900	11000	12100	9900	11000	12100	11600	12800	14100	12800	14200	15600	12800	14200	15600	13400	14900	16400	14000	15600	17100
	0,4760	8600	9600	10500	10300	11500	12700	11400	12600	13900	11800	13100	14500	13200	14700	16200	14600	16200	17800	14700	16300	17900	16100	17800	19600	16700	18500	20400
6 5/8	0,2882	8400	9400	10300	10200	11300	12400	11600	12800	14100	11600	12800	14100	13000	14500	15900	14300	15900	17500	14900	16500	18100	15700	17500	19200	16300	18100	20000
	0,3150	9100	10200	11200	11000	12200	13500	12600	14000	15400	12600	14000	15400	14100	15600	17200	15600	17300	19000	16200	18000	19800	17000	19000	20900	17700	19700	21700
	0,3520	10300	11400	12500	12300	13700	15100	14100	15600	17200	14100	15600	17200	15800	17600	19300	17400	19300	21200	18100	20100	22100	19100	21200	23400	19800	22100	24300
	0,4169	12200	13500	14800	14600	16200	17800	16700	18500	20400	16700	18500	20400	18700	20800	22900	20500	22800	25100	21500	23800	26200	22600	25100	27700	23500	26100	28700
	0,4748	13800	15300	16900	16700	18500	20400	19000	21000	23200	19000	21000	23200	21200	23600	26000	23400	26000	28500	24500	27200	29900	25700	28600	31500	26800	29800	32700
7	0,2720	7500	8300	9100	9700	10800	11900	10900	12100	13300	10900	12100	13300	11900	13200	14500	13300	14800	16300	14300	15900	17600	15000	16700	18400	15600	17300	19100
	0,3169	8800	9700	10700	11400	12600	13900	12600	14000	15400	12600	14000	15400	13900	15400	17000	15600	17300	19000	16700	18500	20400	17600	19500	21400	18300	20300	22300
	0,3618	10100	11200	12300	12900	14300	15700	14300	15900	17600	14300	15900	17600	15800	17600	19300	17600	19500	21500	19000	21000	23200	19900	22100	24300	20600	22900	25200
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	0,3520	15900	17700	19500	18700	20800	22900	23100	25700	28200	23100	25700	28200	25100	27900	30700	26500	29500	32400	27500	30500	33600	29000	32200	35500	29900	33200	36500
	0,4000	18000	20000	22000	21200	23600	26000	24800	27500	30200	24800	27500	30200	27700	30800	33800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4500	20300	22600	24900	24000	26600	29300	27800	30900	34000	27800	30900	34000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,5000	22600	25100	27600	26700	29600	32600	31000	34500	38000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,5571	25100	27900	30700	29600	33000	36300	32700	36400	40000	29900	33200	36500	29900	33200	36500	29900	33200	36500	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}
9 5/8	0,3520	22100	24500	26900	23200	25800	28400	25700	28600	31500	26300	29100	32100	29300	32500	35800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,3949	24700	27400	30200	26000	28900	31800	28900	32100	35300	29400	32600	35800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4350	27100	30100	33100	28500	31700	34900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4720	29400	32700	35900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,5449	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
	0,5949	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
	0,6091	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
	0,7339	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
	0,7969	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
9 7/8	0,6252	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
	0,6610	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
	0,7201	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
10 3/4	0,3500	17400	19300	21200	23900	26500	29200	25200	28000	30800	28300	31500	34700	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4000	21900	24300	26800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4500	27000	30000	33000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4949	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
	0,5449	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
	0,5949	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
11 3/4	0,3331	20300	22600	24900	27800	30900	34000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,3752	24700	27400	30200	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0,4350	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
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	0,5339	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
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11 7/8	0,5500	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
	0,5819	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	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
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	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	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
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	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
13 5/8	0,5551	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
	0,6252	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
	0,7598	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 torque 20% less than the specified.																												

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 under condition 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 ones, 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 F 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% from the coupling nominal outside diameter.

Damages from tong clamps are allowed on the pipe outer surface under condition that the actual pipe wall thickness taking into account depth of the damage shall be not less than 87,5% from 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 chain 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 of 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 the maximum value of the final make-up torque (M_{max}) is achieved, turning of coupling from the side of mill connection is allowed, if the diagram is not changed during correct make-up (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 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 due to 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.

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, and which confirms that make-up is performed correctly.

Depending on the rotary tong used and its adjustment the make-up diagram (especially in area I) can show areas with insignificant deviation from straight line: oscillations, leaps, etc. Such deviations shall be deemed acceptable if general view of the make-up diagram corresponds to the established requirements.

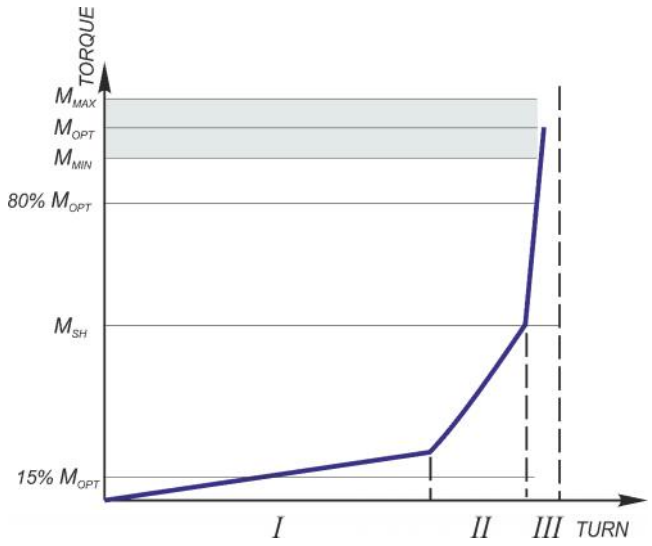


Figure 8 – Correct pin and coupling make-up diagram

6.3.1.2 The make-up diagrams for the pipes from the same lot shall be close in shape.

6.3.1.3 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}.

6.3.1.4 The final make-up torque shall be within the range from the minimum to the maximum make- up torques.

6.3.1.5 Typical cases of make-up diagram shape non-compliance are shown in Figures 9 – 15.

6.3.1.6 If at the final step of make-up procedure torque increase stops and there appears a horizontal area (area IV, Figure 9), but no slippage of clamp jaws is observed and the area IV length is maximum 0.12 of revolution, then such a make-up shall be considered acceptable. If not, the connection shall be broken-out, inspected for absence of damages and deformations. If during inspection of thread, thread seals and thread shoulders surface damages, that can be repaired (Annex B), are observed, re-assembly of the connection can be performed upon elimination of all the damages. If shape distortions, such as decrease of pin or box shoulder inside diameter, sagging on the box inside surface, are observed, or damages, that can not be repaired, are observed the pipes with such damages shall be replaced.

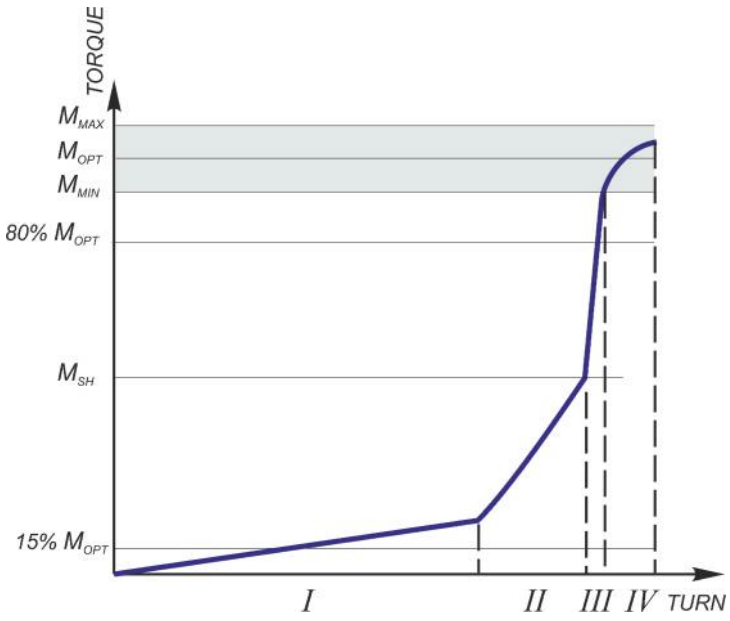


Figure 9 – Make-up diagram. Torque increase stopped in the area IV

6.3.1.7 If the make-up diagram shows slight torque increase due to mating of thread seals (area II, Figure 10), this might be caused by insufficient contact of seal surfaces, or a combination of high thread interference and low seal interference.

If the diagram has a proper shape, it shall be considered that the radial seal component on the make-up diagram is significantly smaller than the thread component, so its size is not always indicative, and such a connection shall be deemed acceptable. However, if there is any doubt in make-up correctness, break out the joint, inspect it and clean if necessary. If visual inspection reveals traces of contact on the thread seals surfaces, repeat make-up. Otherwise the pipe shall be replaced and used in subsequent make-ups.

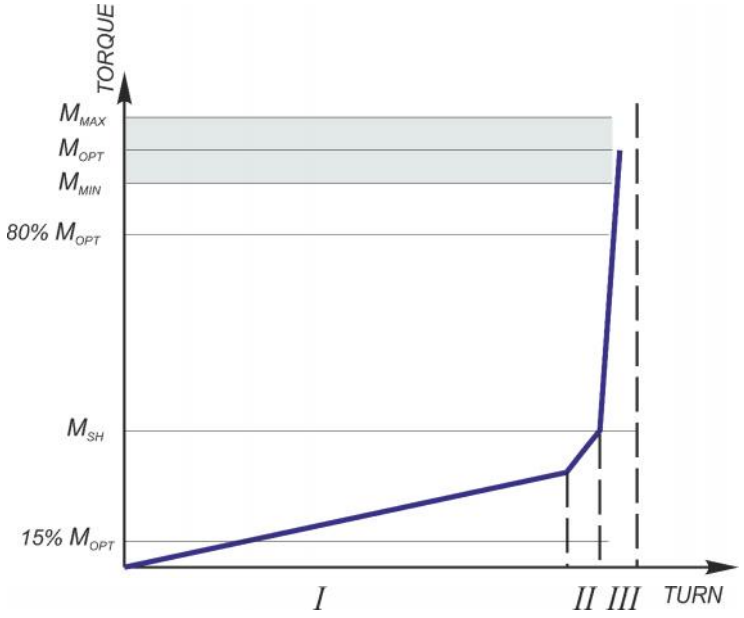


Figure 10 – Make-up diagram. Slight torque increase in the area II

6.3.1.8 Too low value of shoulder torque M_{sh} of thread shoulders on make-up diagram (Figure 11) may result from:

- unfavorable combination of technological parameters of the connection;
- contamination of thread and/or thread seals;

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

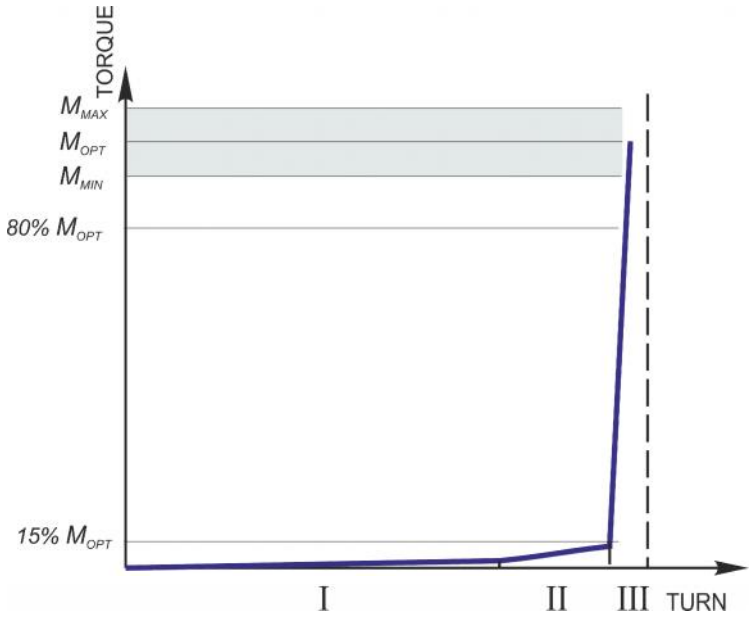


Figure 11 – Make-up diagram. Low value shoulder torque of thread shoulders

6.3.1.9 Too high value of shoulder torque M_{sh} of thread shoulders on make-up curve (Figure 12) may result from:

- damage of thread and/or thread seals;
- improper thread cleaning;
- unfavorable combination of technological parameters of the connection.

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

If the shape of the make-up diagram after re-make-up is 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, is not changed, the connection shall be broken-out and the previous pipe shall be replaced.

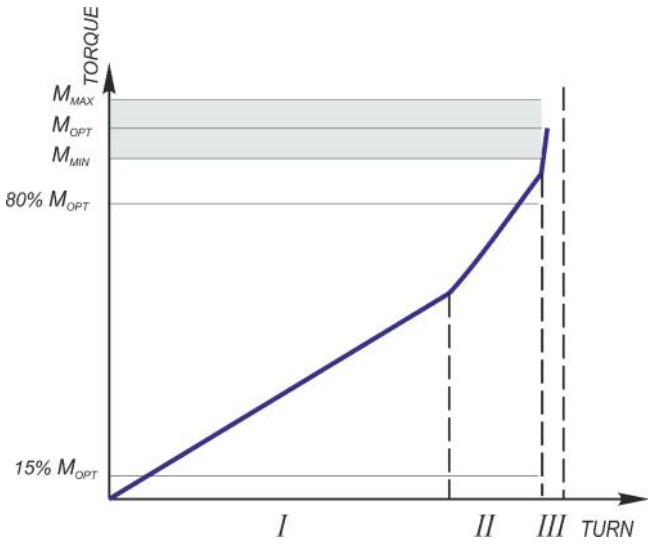


Figure 12 – Make-up diagram. High value shoulder torque of thread shoulders

6.3.1.10 Torque leaps on the make-up curve (Figure 13) may result from:

- contamination of thread and/or thread seals;
- damage of thread and/or thread seals;
- rotary tongs jam;
- uneven force of rotation on shoulder.

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

If the shape of the make-up diagram after re-make-up is 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, is not changed, the connection shall be broken-out and the previous pipe shall be replaced.

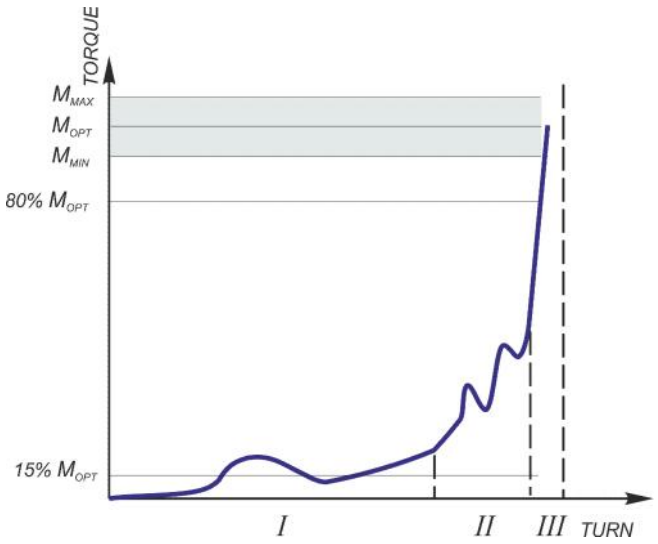


Figure 13 – Make-up diagram. Torque leaps

6.3.1.11 Make-up curve without clean shoulder torque M_{sh} (Figure 14) may result from:

- thread damage;
- improper thread cleaning;
- unfavorable combination of technological parameters of the connection.

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

If the shape of the make-up diagram after re-make-up is 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, is not changed, the connection shall be broken-out and the previous pipe shall be replaced.

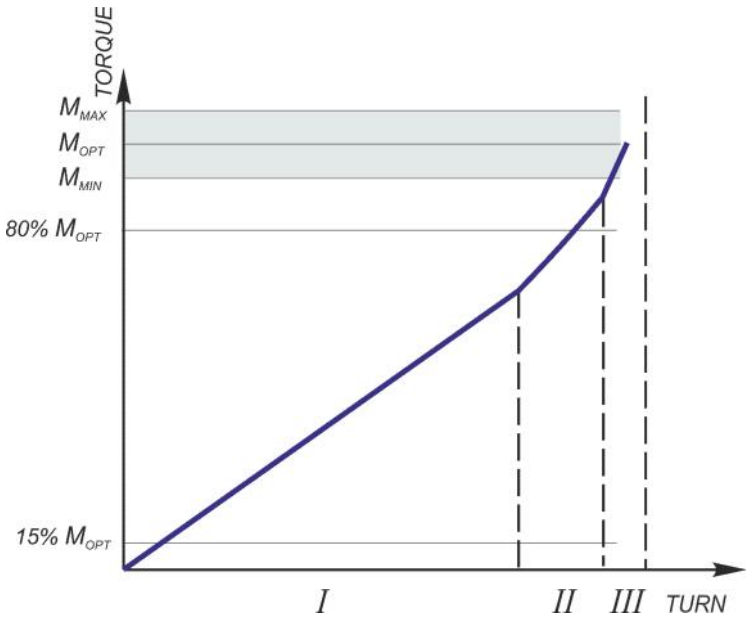


Figure 14 – Make-up diagram. No clear shoulder torque of thread shoulders

6.3.1.12 Make-up curve with a wave-like effect not exceeding shoulder torque M_{sh} (Figure 15) may result from:

- improper thread cleaning;
- contamination of thread and/or thread seals;

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

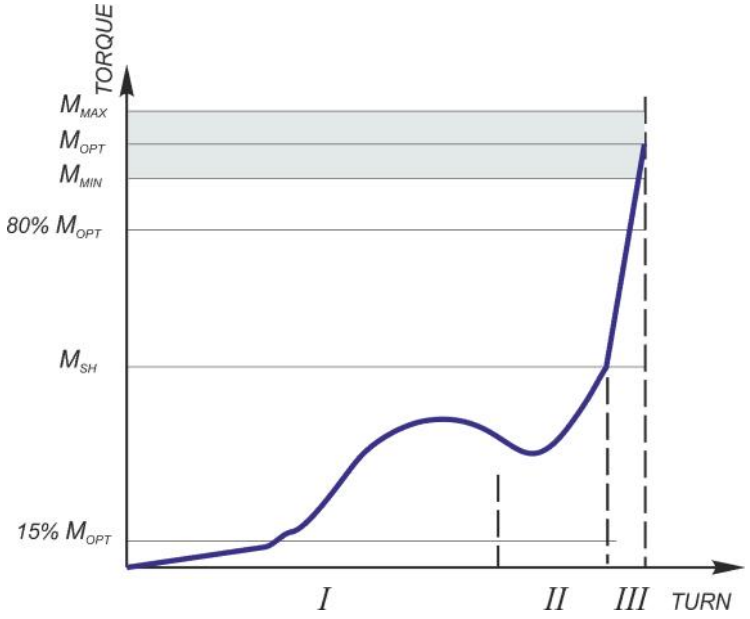


Figure 15 – Make-up diagram. Wave-like effect

6.3.1.13 Any time the make-up curve is of improper shape, break out the connection. Pin and coupling connections 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.

6.3.2 When make-up is checked by triangle marking (transverse stripe), correct make-up is proved by alignment of coupling end-face with the base of make-up triangle (transverse stripe) on the pin with allowable deviation ±0.0197 inch.

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 ones, 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% from the coupling nominal outside diameter.

Damages from tong clamps are allowed on the pipe outer surface under condition that the actual pipe wall thickness taking into account depth of the damage shall be not less than 87,5% from 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 coupling;

– 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 PF ET 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 PF ET 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 vertical axis and number of turns along 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 make-up diagram shall have the following characteristics:

– Sufficient resolution (at least 800 × 600 pixels) for precise curve display. Display shall be at least 0.9843 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 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.

Displayed make-up results shall not be sufficient for acceptance or rejection of make-up operations. 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.

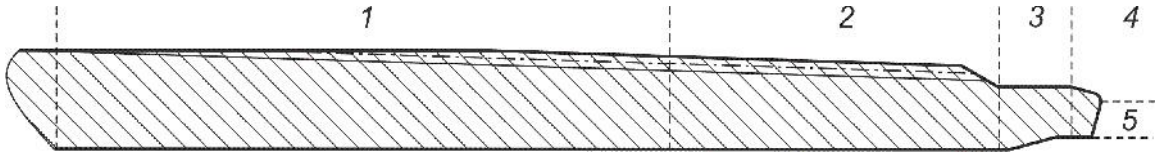
If any unacceptable damages are detected on pipes, such pipes shall be rejected then and reported accordingly specifying pipes serial numbers, describing defects found with photos attached.

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

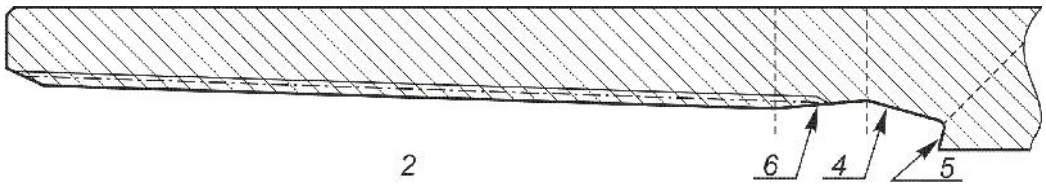
Surface area (Figure B.1)	Type of damage	Damage repair method
1, 2, 5	Pit corrosion less than 0.0039 inch deep or insignificant surface rust	Manual repair (removal) using non-metal brush with soft bristle or polishing paper with grain 0
	Pit corrosion more than 0.0039 inch deep	Not to be repaired
	Burrs 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 or insignificant surface rust	Manual repair using 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
	Insignificant surface rust	Buffing
	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 made of a detected defect using special tape (X Coarse material of Testex company for defects up to 0.0039 inch deep, for deeper defects: X-Coarse Plus or equivalent). Mould height shall be measured with a thickness gage, measurement accuracy shall be at least 0.0039 inch (PEACOCK G2-127 or equivalent);



a) – Surface of external thread connection



b) – Surface of internal thread connection

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

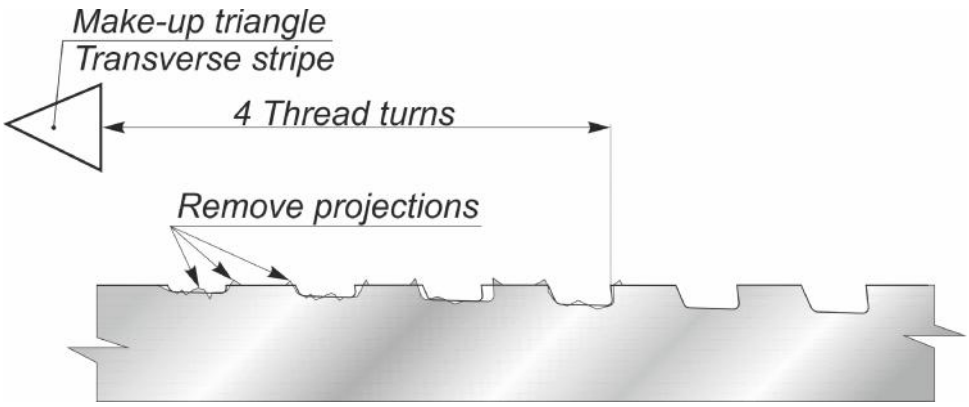
Figure B.1 – Surfaces of pin and box connection

– depth gage with a needle-type contact point (contact point diameter shall be maximum 0.0039 inch), measurement precision shall be minimum 0.0039 inch (PEACOCK T-4 or equivalent).

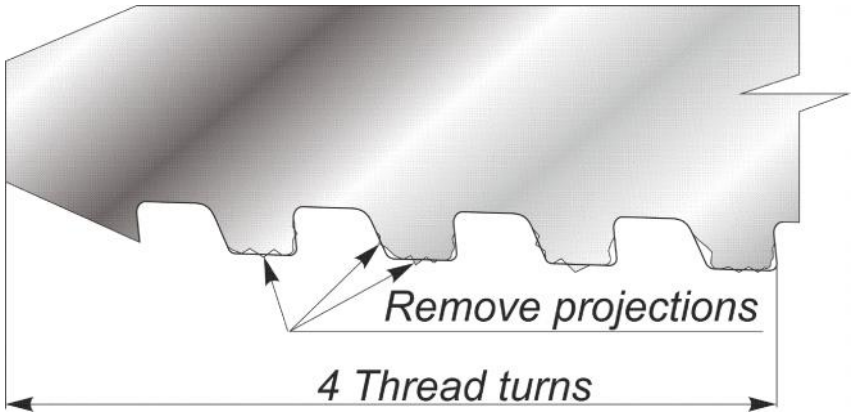
B.3 Possible types of damages of thread, thread seals and thread shoulders surfaces of pins and couplings during make-up, as well as repair methods are specified in Table B.2.

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

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



a) – Surface of external thread connection



b) – Surface of internal thread connection

Figure B. 2 – Surface of pin and box connection

B.4 If after repair or break-out surface damages exceed 20% of GW compound surface area on coupling, a uniform layer of RUSMA Polimer Premium P 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 B.

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 as per TU 0254-001-46977243-02;

– RUSMA P-4 as per TU 0254-031-46977243-04;

– RUSMA SP as per TU 0254-102-46977243.

While making-up pipes of chromium steels RUSMA P-14i compound shall be used per TU 0254-068-46977243.

Upon coordination with the connection designer, other than mentioned thread compounds may be applied; provided they comply with 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 with 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!

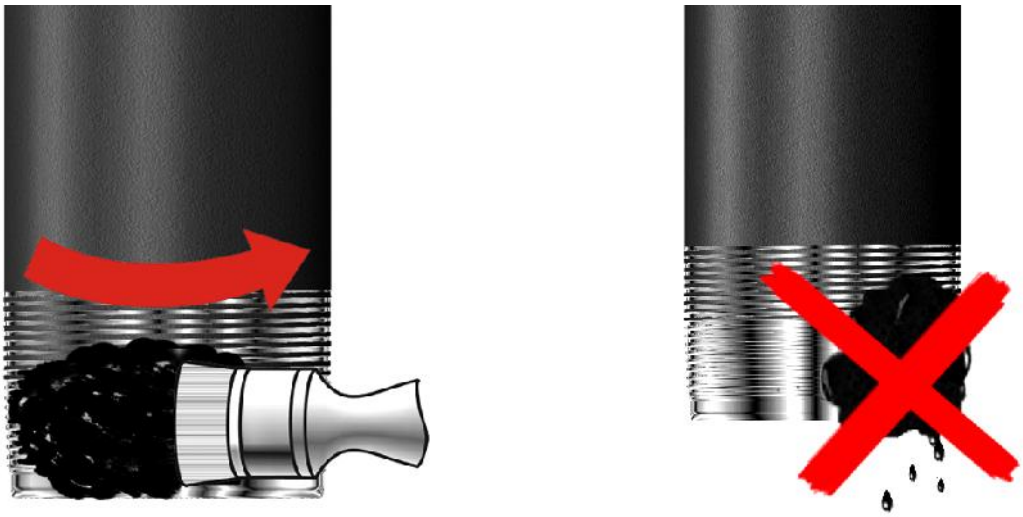


Figure C.1 – Proper and improper application of thread compound

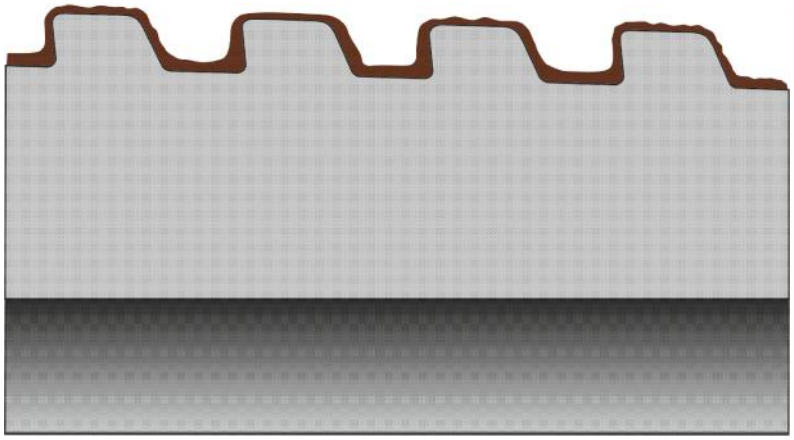


Figure C.2 – Proper distribution of thread compound over thread profile

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 lb for make-up of one thread connection shall be calculated as follows:

$$m_{min} = 0.014 \times D \quad \text{(C.1)}$$

$$m_{max} = 0.017 \times D \quad \text{(C.2)}$$

where:

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

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

D – nominal outside diameter, inch, 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 4.5000 inch:

$$M_{min} = 0.014 \times 4.5000 = 0{,}0630 \text{ ù } 0.06 \text{ lb}$$

Here with, at least 0.04 lb shall be applied on coupling end and at least 0.02 lb – 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 optimal 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.