T M K - P R E M I U M S E R V I C E S
(T M K - P S)

GUIDELINES for USE

RE PS 02-005-2012

USE OF
TMK UP PF THREAD CONNECTION FOR TUBING

Revision 12

2022

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”.

Information about the guidelines for use

1 APPROVED BY Head of Premium Connections Development Department
TMK – Premium Services, LLC

A. S. Myslevtsev

August 16, 2023

2 DEVELOPED BY: Serial Design Bureau

3 Revision 12 Effective date is 21 August 2023 with an option of early use.

4 For replacement of Revision 11 introduced into effect in August 11, 2022.

5 The present revision contains changes and additions in relation to the previous revision and amendments, which are highlighted in the text.

Contents

G U I D E L I N E S S F O R U S E

USE OF
TMK UP PF THREAD CONNECTION FOR TUBING

Effective date 21 – 08 – 2023

1 Scope

The present guidelines contain recommendations for maintenance and use of tubings with TMK UP PF thread connection with Green Well Crystal compound (further – GWC) 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:

GOST R ISO 13678 2015 Casing, Tubing, Pipe Line and Elements of Drill Strings for Oil and Gas Industry; Evaluation and testing of thread compounds

GOST15150-69 Machines, Instruments and Other Industrial Products. Modifications for different climatic regions. Categories, Operating, Storage and Transportation Conditions as to Environment Climatic Aspects Influence

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

RD 39-7-904-83 Instruction on Material, Equipment and Spare Parts Storage in Warehouses on Facilities of Production and Technical Servicing and Completing, Enterprises and Entities of Ministry of Oil Industry

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

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

TU 0254-068-46977243-2009 RUSMA R–14, RUSMA R–14 (3)Special Thread Compounds

TU 19.20.29-223-46977243-2018 RUSMA API Modified 1000 Thread Compound

TU 19.20.29-330-46977243-2022 RUSMA OCTG Compound.

TU 0254-167-46977243-2015 “RUSMA API Modified thread Compound”

TU 0254-158-46977243-2013 RUSMA Storage Compound.

TU 19.20.29-250-46977243-2018 RUSMA-M3 Compound.

Draft of STO TMK 5660 1056-0046 Green Well Crystal compound for thread connections of casings and tubings General Technical Requirements

N o t e - The specified document edition shall be applied for dated references taking into account all issued amendments. The 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 **rotation on shoulder:** Preset movement of thread connection in circumferential direction after thread connection surfaces shouldering.

3.2 **box (box connection):** The product with a thread connection on an inside surface.

3.3 **pin (pin connection):** The end of pipe with a thread connection on an outside surface.

3.4 **thread connection (make-up result)**: Make-up of pin and coupling by means of thread.

3.5 **thread connection (structural element)**: Thread, seals, and shoulders machined on pin and coupling, and other auxiliary elements of structure of thread connections;

3.6 **thread seals:** Pin sealing groove and coupling sealing bore ensuring tightness of thread connection upon pin and coupling make-up.

3.7 **thread shoulders:** Pin shoulder and box shoulder acting as an arrester upon pin and coupling make-up.

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 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 steels with the chrome content 3% and over (with grades containing Cr letters) and of chrome-nickel alloys (with grades containing Cr and Ni letters) 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 to loading platform or deck bundles of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters), it is required to use nylon harnesses.

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.

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 pipe end 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 the pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters) 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 pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters) shall exclude collision of pipes.

4.3 Stockholding and storage

4.3.1 Pipe storage conditions shall comply with GOST 15150 for Group 4 (long-term storage) or Group 8 (short-term storage up to three months and service interruptions).

4.3.2 Pipes, equipment and spare parts storage in warehouses on facilities of production and technical servicing and completing, enterprises and entities shall be according to RD 39-7-904-83.

4.3.3 Requirements for storage and stockholding of casings:

- pipes are not allowed to be stacked on the ground, rails, steel or concrete foundations without wooden blocks;

- to exclude ingress of dust, moisture from the ground and foreign objects the first layer of pipes shall be located above the ground at the distance of not less than 13.7795 inch;

- the distance between the supports shall be such as to avoid sagging or thread damage. Wooden blocks shall be located horizontally and in the same plane, and supports (racks) shall withstand the weight of all the pipe pile with wooden blocks without sagging. There shall be at least four supports either wooden or similar in properties to wooden blocks, with the height that provides that couplings do not touch each other.

- the height of bundled pipe piles including the use of wooden blocks shall not exceed 118.1102 inch;

- when stockholding unbundled pipes it is required to use piece by piece scheme of stacking. The ranks of pipes shall be divided by wooden blocks to exclude any load on couplings. It is required to use at least four wooden blocks. It is required to place wooden blocks at right angle to pipes and directly above the wooden blocks and supports of the previous ranks to avoid sagging. It is not allowed to locate wooden blocks under thread protectors;

-pipes from steels with the chrome content 3% and over (with grades containing Cr letters) and of chrome-nickel alloys (with grades containing Cr and Ni letters)

need to be stored separately, no contact between the pipes and steel racks are allowed.

- the pipes shall be equipped with the thread protectors during the whole period of storage as well as during handing operations;

- to ensure condensed water discharge form the pipe body and to exclude condensed water entering into coupling, stockholding of casings with a slope from 0.1969 to 0.2756 inch per 3.28084 ft run towards pipe pin end is recommended.

4.3.4 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 connection or thread protectors.

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

4.3.6 During pipe storage for more than 6 months before use the compound under safety parts shall be renewed, except for the pipes with thread compounds of longer period of storage.

If pipes and couplings are covered with Green Well Crystal (GWC) compound, the compound under thread protectors shall be renewed if pipes are stored for more than 12 months.

For this purpose the following actions shall be performed:

– unpack the package and roll the pipes;

– remove thread protectors according to para. 5.3;

– remove initial compound or GWC according to para. 5.4;

– apply storage compound (Kendex OCTG, BESTOLIFE Storage Compound (BSC), Total Jet Marine, RUSMA Storage Compound, RUSMA-M3, RUSMA OCTG or thread compound with storage properties), with the expiration date of minimum 6 months – till the next compound renewal or pipe usage;

– Install the thread protectors that were previously removed, make sure they are cleaned from old compound, or install new thread protectors according to para. 5.8.

– after completion of operation, package the pipes in compliance with packing list or store separately.

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

4.3.8 When stockholding of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and of chrome-nickel alloys (with grades containing Cr and Ni letters) working (bearing surfaces) of racks shall be covered

with non-metallic material (for example, rubber, polyurethane and etc.) or non-metallic blocks (wooden or plastic).

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

4.3.10 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 exclude the risk of additional reassorting.

5 Preparation of pipes for make-up

5.1 General

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;
- remove preservation compound from external and internal thread connections (in case of use of thread compound, removal is not required, see. 5.4.4);
- inspect surfaces of external and internal thread connections;
- 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

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

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

5.2.3 Pipes and couplings connections, thread protectors with 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

5.3.1 Thread protectors shall be removed upon visual inspection of pipes and couplings.

5.3.2 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 Compound removal

5.4.1 After removal of thread protectors, external and internal thread connectionsshall be cleaned from preservation compound by hot soapy water or with a steam cleaner. It is recommended to supply water under pressure. In case of freezing temperature, compound may be removed by using a solvent (Nefras, white spirit or similar). After compound is removed, thread connection shall be purged with compressed air or cleaned with dry rags.

Compound and GWC compound shall not be removed using diesel, kerosene, salty water, barite or metal brushes!

5.4.2 Barite or metal brushes can cause scratches on surfaces of sealing elements resulting in loss of tightness.

5.4.3 After compound is removed, thread connections shall be purged with compressed air or cleaned with dry rags.

5.4.4 When pipes are supplied with thread compound RUSMA-1 (з), RUSMA R-4 (з), RUSMA R-14 (з) under thread protectors, it is allowed to perform the first running and pulling operation with mill compound if mill thread protectors are screwed on and are not damaged.

5.4.5 After thread protectors are screwed off from pipes with the thread compound applied, it is necessary to be sure that:

- no potential damages are detected under the thread compound RUSMA Crystan C, RUSMA Crystan Chrome according to the requirements of para 5.5.3 and 5.5.4.

– the compound is free of foreign particles (if there are foreign particles, compound shall be removed according to 5.4.1, and reapplied according to 6.1);

– The compound is applied onto thread in an even layer (make the surface even and/or add the compound of the same type if necessary);

– the pipe was manufactured not more than 1 year ago according to the Certificate of quality of the manufacturer.

5.4.6 When pipes are supplied with GWC compound under thread protectors, the first running and pulling operation is carried with GWC compound if mill thread protectors are screwed on and are not damaged.

GWC compound is transparent, this allows to perform inspection of thread connections after thread protectors are screwed off with the compound.

5.4.7 After thread protectors are screwed off from pipes with GWC thread compound applied, it is necessary to be sure that:

- no potential damages of thread connections are detected under GWC thread compound according to the requirements of paras 5.5.3 and 5.5.4.

– GWC compound is free of foreign particles (if there are foreign particles, the compound shall be removed according to 5.4.1, and reapplied according to 6.1);

– the pipe was manufactured not more than 1 year ago according to the Certificate of quality of the manufacturer.

5.5 Thread connection inspection

5.5.1 Thread connection shall be inspected by the following specialists:

– Crews for tubing assembly;

– Companies specialized in tubing inspection;

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

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

5.5.3 When inspecting pipe and coupling thread connections, make sure you pay due attention to the presence of:

– damages resulting from pipes collisions or other impacts;

– damages resulting from installation of thread protectors;

– rust, corrosion or other chemical damages caused as a result of environmental exposure or due to aggressive agents.

5.5.4 Possible damages that might occur on thread connections surface before pipe and coupling putting into operation and the ways of the damages elimination are listed in Table 1 for defined areas of thread connections, indicated in Figure 1.

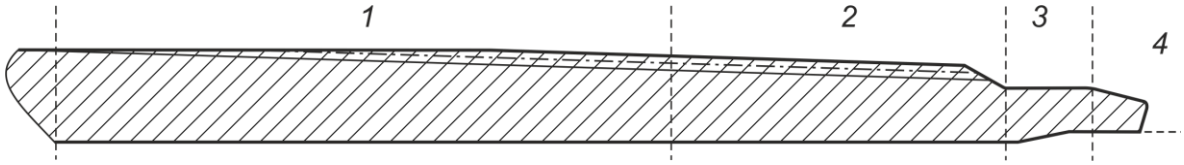
Thread area with imperfect profile thread on pipes (Area 1 on Figure 1a) has an unfinished surface of thread crests (black-crested threads), corresponding to the surface of pipe body, and interruption of the last thread turns.

Note - Surface quality of unfinished thread crests complies with the quality of pipe body surface

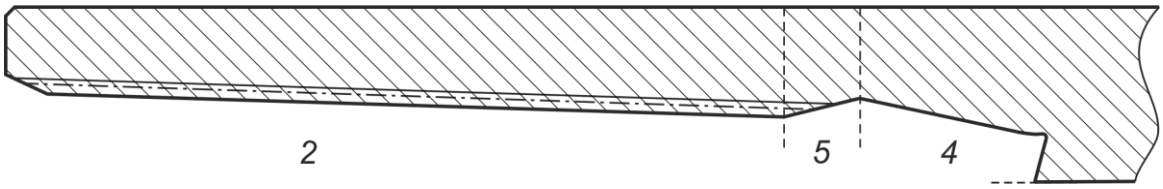
The length of an area of pipe thread with perfect profile and of an area, on which no interruption of thread turns shall be, is determined in accordance with Table 2.

Table 1 - Types of possible damages of thread connections surface before putting into operation and methods of their repair.

Surface area (Figure 1)	Type of damage	Damage repair method
1.2	Surface corrosion (rust), pit corrosion not more than 0.0039 inch depth	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
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Manual repair using needle file or polishing paper with grain 0
	Dents, nicks, grooves and other defects with the depth of more than 0.0039 inch	not to be repaired
3.5	Surface corrosion (rust), pit corrosion not more than 0.0118 inch depth	Manual repair using needle file or polishing paper with grain 0
	Pit corrosion more than 0.0118 inch deep	not to be repaired
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Manual repair using needle file or polishing paper with grain 0
	Dents, nicks, grooves and other defects with the depth of more than 0.0039 inch	not to be repaired
4	Pit corrosion of any depth	not to be repaired
	Surface corrosion (rust), removed by buffing	Repair by buffing
	Grooves removed by buffing	Repair by buffing
	Dents, nicks and other defects of any depth	not to be repaired



a) – Surface of external thread connection



b) – Surface of internal thread connection

1 – imperfect profile thread; 2 – perfect profile thread; 3 – cylinder groove; 4 – seal and shoulders. 5 – tapered bore;

Figure 1

5.5.5 Determination of corrosion depth and defects is recommended to perform using:

– 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).

5.5.6 If any irreparable damages are detected, pipes shall be rejected then reported accordingly specifying pipes serial numbers, describing damages found with photos attached.

5.6 Drifting

5.6.1 Drifting shall be performed using a mandrel along the entire length of pipes. For drifting of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters) polymer and aluminium drift mandrels should be used.

5.6.2 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.

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

Table 2 - Length of thread area with perfect profile and an area without interruption of thread turns

In inches

Pipe outside diameter, D	Wall thickness, S	Length of thread area with perfect profile, Not less than [1)]	Length of thread area without interruption of thread turns, not less than [1)]
2 3/8	0.1902	0,7480	2,0866
	0.2539		
	0.2949		
	0.3358		
2 7/8	0.2169	0,8661	2,2047
	0.2760		
	0.3079		
	0.3402		
	0.3921		
	0.4402		
3 1/2	0.2161	1,1417	2,4803
	0.2539		
	0.2890		
	0.3748		
	0.4299		
	0.4760		
	0.,5299		
4	0.2260	1,4567	2,7953
	0.2618		
	0.3299		
	0.4150		
4 1/2	0.2709	1,4567	3,2677
	0.3370		
	0.3799		
	0.4299		
	0.5000		

[1)] Measurement of the length of areas is carried out from the end face of pipe.

5.6.4 Dimensions of the drifts effective part shall comply with those specified, in Table 3. According to customer's request and in case of additional requirements in an order,

use of special mandrels which sizes differ from those specified in Table 3 is allowed.

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

5.6.6 Pipes rejected during drifting process, shall be put aside until further decision on their validity and recorded in product quality non-compliance report.

Table 3 – Dimensions of the effective part of the mandrel

In inches

Pin outside diameter, inch;	Effective length of the mandrel, inch;	Diameter of the effective part of the mandrel, inch;
up to 2 7/8 incl.	42,0079*	*d* **– 0,0937
above 2 7/8	42,0079*	*d* **– 0,1252

* Drifts with the effective part 49.2126 inch are allowed to be used.
** d – pipe inside diameter

5.7 Measurement of length of pipes

5.7.1 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.

5.7.2 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;

∑Lф – 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 according to Table 4.

Table 4 – Decrease of pipe length during make-up process

In inches

Pin outside diameter, inch;	Decrease of pipe length during make-up Δ*L*, inch;
2 3/8	2.8346
2 7/8	2.9331
3 1/2	3.2323
4	3.5472
4 1/2	4.0787

5.8 Thread protectors installation

5.8.1 After inspection and control, thread protectors or caps shall be re-installed on pin and coupling thread connections.

It is not allowed to store pipes and couplings thread connections wothout applied storage or thread compound and without thread protectors for more than 4 hours!

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

6 Make-up of pipes

6.1 Application of thread compound

6.1.1 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 or GWC compound.

It is recommended to use:

- the following thread compounds: RUSMA-1 and its modifications, RUSMA- R-4 and its modifications, RUSMA Crystan C, RUSMA API Modified 1000, RUSMA API Modified, Bestolife API Modified, Bestolife 72733, Bestolife 2000, Bestolife API Modified HP / HT, Bestolife 2000 NM, JET-LUBE API Modified.

- GWC compound

When making-up pipes made of steels with the chrome content 3% and over (with grades containing Cr letters) and of chrome-nickel alloys (with grades containing Cr and Ni) it is recommended to use thread compounds Bestolife API Modified, Bestolife 72733, JET-LUBE API Modified, РУСМА API Modified and РУСМА Р-14 and its modifications and GWC compound.

By agreement with the developer of the connection, other thread compounds that meet requirements of API RP 5A3/ISO 13678 or GOST R ISO 13678 are allowed.

6.1.2 It is not allowed to mix thread compound and GWC compound during make-up of thread connection.

To ensure proper make-up it is required to:

- remove GWC compound from thread connection of pin or coupling according to para 5.4 and apply thread compound on thread connection of pin or coupling according to para 6.1.

- remove GWC compound from thread connection of pin or coupling according to para 5.4 and apply GWC compound on thread connection of pin or coupling according to para 6.1.

6.1.3 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.

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

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

- when assembling one casing string, if GWC compound is removed it is allowed to use thread compound according to para 6.1.1;

– 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 the 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.

6.1.5 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 2 and 3 demonstrate proper and unacceptable application of thread compound.

Before application of thread compound, thread connection surface shall be thoroughly cleaned and dried.

Never use metal brushes for compound application!

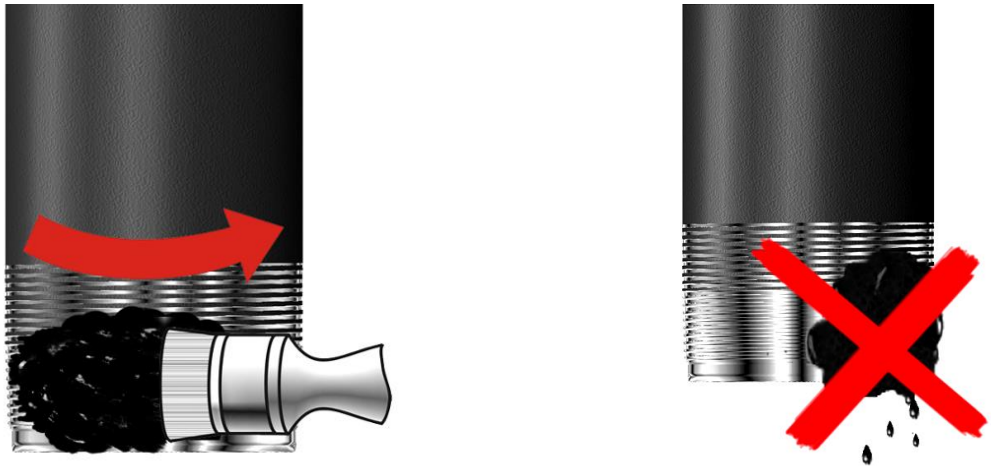


Figure 2

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

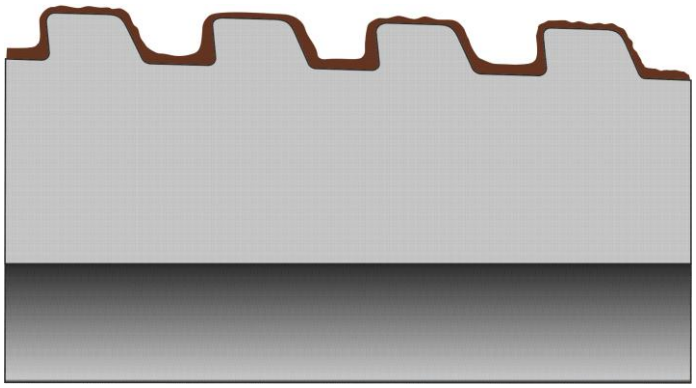


Figure 3

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:

$$m_{min} = 0.20\ D \quad (1)$$

$$m_{max} = 0{,}25\ D \quad (2)$$

where: m_{min} - is the minimum compound mass in gram rounded to an integral value;

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

D is the 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 a coupling and pipe with the outside diameter of 88.9 mm (3 1/2):

m_{min} = 0,2 x 89 ≈18 gr (0.64 oz) with at least 12 gr (0.42 oz) per coupling and at least 6 gr (0.21 oz)per pin.

N o t e - Calculated compound mass is theoretical.

6. 1. 7 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 of one type is available.

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

- if shoulder torque of thread shoulders is from 25% of optimum make-up torque and final make-up torque exceed shoulder torque by 20%;

– 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.

Rotation on shoulder (without break-out) is allowed, at the same time it is necessary to ensure 20% difference between shoulder torque and make-up torque.

6.2 Running and pulling

6.2.1 Casing shall be assembled by a qualified personnel. Make-up of connection with the use of torque registration system and make-up diagram plotting is the method ensuring proper make-up and claimed by the manufacturer technical properties of the connection.

Methods of make-up inspection with the use of manometer of breakout tong, make-up triangle (transverse stripe) do not ensure proper make-up and can be used by the user at his own and sole discretion without any guarantees on behalf of PAO “TMK” to get the claimed by the manufacturer technical properties of the connection.

6.2.2 A special stab guide or bell guide is recommended for running and pulling operations (Figure 4). This device helps to align pin and coupling and prevent the connection from damage.

6.2.3 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 or its absence, a driller shall control constant weight on hook (within limits ±100 kg (±220.46 lb)) taking into consideration pipe weight.

6.2.4 While running a string of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters) it is recommended to use an elevator and special wedge clamps to avoid pipe body damages.

Figure 4

6.2.5 Rotary tong or casing make-up system shall be equipped with a speed governor and shall ensure:

-- at the initial stage - speed of make-up of not more than 2 -5 rpm for safe entering of external thread into internal thread.

- at the stage of the main make-up - smooth rotation of a pipe at the speed of not more than 10 rpm;

- at the stage of rotation on shoulder - make-up speed of not more that 2 - 5 rpm and smooth rotation of a pipe without jerks and stops.

If break-out of thread connection according to. 6.5 and casing make-up system use are required, rotary tongs shall be provided.

Rotary tongs shall be equipped with clamps for pipe sizes used to ensure a sufficient surface area contacting 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 pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters), 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 5.

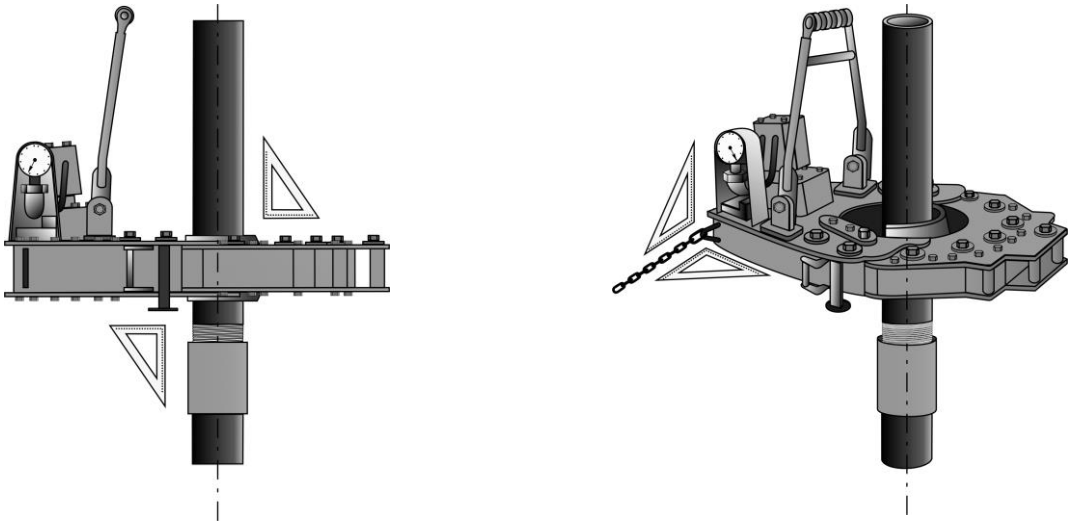


Figure 5

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

6.2.7 When running pipes and couplings with the special outside chamfer and special couplings (with reduced outside diameter) it is necessary to use slip-type elevators (spider-elevators).

Wedge clamps and slips of the elevator shall be clean, without visible mechanical damages and deformation of the edges, shall comply with the outside diameter of the pipe run in the hole and shall evenly enclose the pipe at the gripping point.

It is necessary to ensure that the wedge clamp and slips of the elevator are lowered simultaneously. Their uneven lowering may result in formation of dents or severe cuts on pipes. Elevator latch shall be checked for proper operation.

Note – Traces of slips of the elevator and of pipe tong dies have a negative influence on pipes. It is required to take all possible measures to minimize such damages.

6.3 Assembly of string

6.3.1 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 (clepo) is not allowed!

6.3.2 Prior to assembly of the string, remove thread protectors or end caps (clepo) and check surfaces of seals and thread shoulders of the free pipe end for any mechanical damage according to Figure 6.

6.3.3 Prior to assembly of the string it is required to control alignment of pipes and decline, proper position of pipes (Figure 7 a).

Inspection of alignment of pipes shall be carried out according to the requirements of Annex A.

6.3.4 Misalignment (Figure 7 b) and decline (Figure 7 c) can be eliminated as follows:

- turning of pipe using topdrive;
- changing position of an elevator;
- directing a derrick man accordingly, and etc.

Maximum misalignment of pipes connected

shall not exceed 0.7874 inch.

6.3.5 Compound shall be applied according to para. 6.1. It is recommended to perform air blasting of external and internal threads prior to compound application.

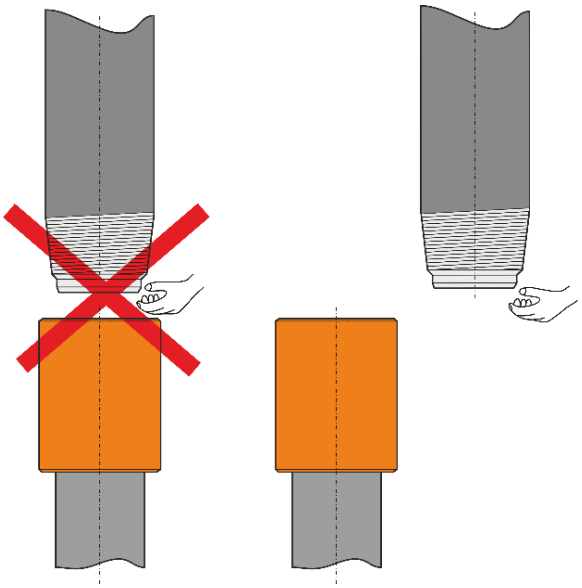
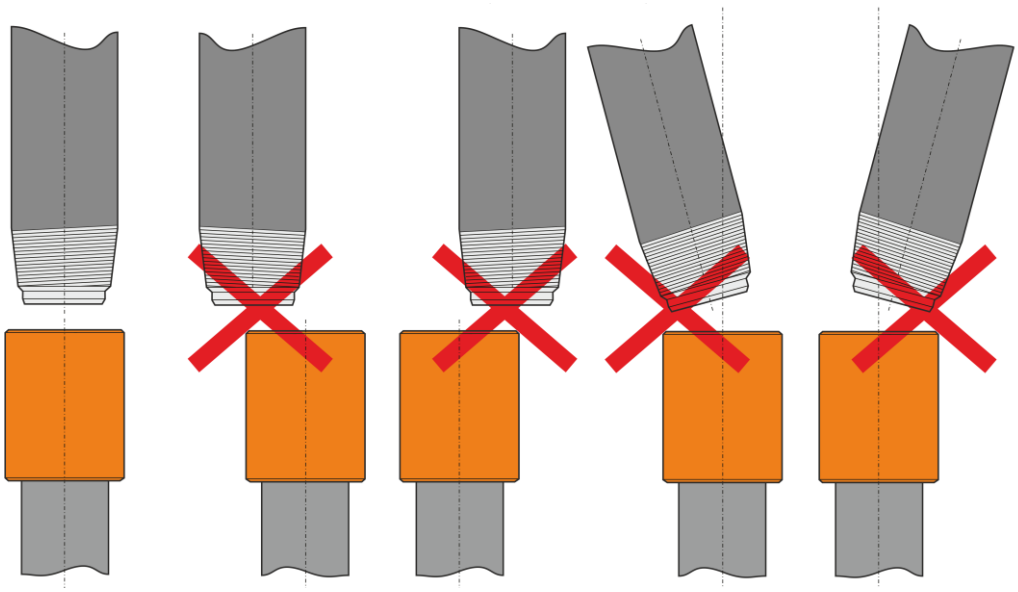


Figure 6



a) **b)** **c)**

Figure 7

6.3.6 Make sure prior to make-up, that surfaces of thread, thread seals and thread shoulders with applied compound 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 and apply thread compound again.

6.3.7 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.

6.3.8 The make-up torque for a thread connection shall be within the range from the minimum up to the maximum torques specified in table 5 for the corresponding sizes and grades.

If thread connection make-up with torque within the limits shown in Table 5 is not in compliance with specified requirements, M_{opt} can be corrected but not more than by ±10 %. Herewith the values of M_{min} and M_{max} shall also be corrected, but maximum ±10 % from the corrected M_{opt}.

Change of make-up torque within a wider range is allowed only subject to agreement with the developer of thread connection.

6.3.9 During make up of pins and couplings made of steels of different grades and with different wall thickness, the make-up torque value shall be chosen according to the lowest steel grade and the smallest wall thickness of both pin and coupling.

At the same time the working characteristics of string are limited by the smallest characteristics of pipes made-up with couplings.

Example 1 - during make-up of pipes with the outside diameter and wall thickness of 88,90×9,52 mm (3 1/2 12,70 ppf), grade J55, with couplings with the outside diameter of 88,90×10,92 mm (3 1/2 14,30 ppf), grade P110, torque corresponding to the smallest characteristics of pipes and couplings (88,90×9,52 mm (3 1/2 12,70 ppf), grade J55) should be chosen for make-up. And the working characteristics of string should comply with the chosen characteristics of pipes and couplings (88,90×9,52 mm (3 1/2 12,70 ppf) grade J55).

Example 2 - during make-up of pipes with the outside diameter and wall thickness of 88,90×9,52 mm (3 1/2 12,70 ppf), grade P110, with couplings with the outside diameter of 88,90×10,92 mm (3 1/2 14,30 ppf), grade N80, torque corresponding to the smallest characteristics of pipes and couplings (88,90×10,92 mm (3 1/2 14,30 ppf), grade N80) should be chosen for make-up. And the working characteristics of string should comply with the chosen characteristics of pipes and couplings (88,90×10,92 mm (3 1/2 14,30 ppf) grade N80).

6.3.10 Make-up of pins and couplings shall be performed with the use of make-up registering equipment, by make-up diagrams, at that it shall meet the requirements specified in Annex B.

Make-up of pipes and couplings without make-up registering equipment is performed using make-up torques and make-up triangle (transverse stripe) applied by the manufacturer on free pipe ends (figure 8).

Transverse stripe can be applied (in light paint) on pipe instead of make-up triangle.

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 near edge) on the pin with allowable deviation 0.0394 inch.

Above inspection methods are secondary, and they do not provide for assessment of make-up quality.

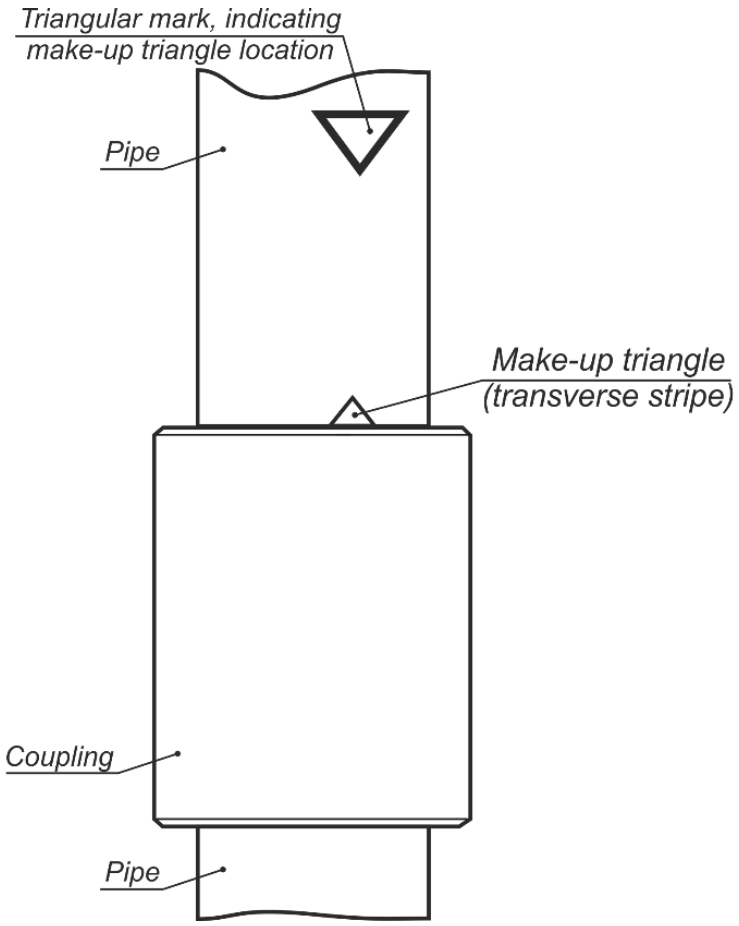


Figure 8

Table 5 – Make-up torques

D, Inch	*S*, Inch	Torque, ft lb for steel grades																							
		J55, K 55			N80, L80			C90			R95, T95			P110, C110			Q125			Q135, TMK135			TMK 140		
		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}
2 3/8	0.1902	12800	13700	14700	12800	13700	14700	13700	14700	16700	13700	15700	17700	15700	17700	19600	17700	19600	21600	18600	20600	22600	18600	20600	22600
	0.2539	14700	16700	18600	15700	17700	19600	15700	17700	19600	17700	19600	21600	19600	21600	23500	22600	24500	27500	22600	24500	27500	22600	25500	28400
	0.2949	16700	18600	20600	16700	18600	20600	18600	20600	22600	19600	21600	23500	20600	22600	24500	23500	26500	29400	24500	27500	30400	25500	28400	31400
	0.3358	17700	19600	21600	18600	20600	22600	19600	21600	23500	20600	22600	24500	22600	25500	28400	25500	28400	31400	26500	29400	32400	27500	30400	33400
2 7/8	0.2169	19600	21600	23500	19600	21600	23500	21600	23500	25500	22600	25500	28400	24500	27500	30400	28400	31400	34300	28400	31400	34300	29400	32400	35300
	0.,2760	22600	25500	28400	22600	25500	28400	24500	27500	30400	26500	29400	32400	29400	32400	35300	33400	37300	41200	33400	37300	41200	34300	38300	42200
	0.3079	23500	26500	29400	24500	27500	30400	26500	29400	32400	28400	31400	34300	31400	34300	38300	34300	38300	42200	35300	39200	43200	36300	40200	44100
	0.3402	26500	29400	32400	26500	29400	32400	28400	31400	34300	30400	33400	36300	33400	37300	41200	38300	42200	46100	39200	43200	47100	40200	44100	49100
	0.3921	29400	32400	35300	30400	33400	36300	31400	35300	39200	33400	37300	41200	37300	41200	45100	42200	47100	52000	42200	47100	52000	44100	49100	54000
	0.4402	31400	35300	39200	32400	36300	40200	34300	38300	42200	37300	41200	45100	40200	44100	49100	46100	51000	55900	47100	52000	56900	49100	54000	59800
3 1/2	0.,2161	31400	35300	39200	32400	36300	40200	34300	38300	42200	37300	41200	45100	40200	44100	49100	46100	51000	55900	47100	52000	56900	49100	54000	59800
	0.2539	34300	38300	42200	35300	39200	43200	38300	42200	46100	40200	44100	49100	44100	49100	54000	50000	55900	61800	51000	56900	62800	53000	58900	64700
	0.2890	37300	41200	45100	38300	42200	46100	40200	45100	50000	43200	48100	53000	48100	53000	57900	54000	59800	65700	54900	60800	66700	56900	62800	68700
	0.3748	43200	48100	53000	44100	49100	54000	48100	53000	57900	50000	55900	61800	55900	61800	67700	63800	70600	77500	64700	71600	78500	66700	73600	81400
	0.4299	47100	52000	56900	48100	53000	57900	51000	56900	62800	54000	59800	65700	58900	65700	72600	67700	75500	83400	68700	76500	84400	71600	79500	87300
	0.4760	50000	55900	61800	51000	56900	62800	54900	60800	66700	57900	64700	71600	64700	71600	78500	72600	80400	88300	74600	82400	90300	76500	85300	94200
	0.,5299	54000	59800	65700	55900	61800	67700	59800	66700	73600	62800	69700	76500	68700	76500	84400	78500	87300	96100	80400	89300	98100	83400	92200	101000
4	0.2260	35300	39200	43200	36300	40200	44100	39200	43200	47100	41200	46100	51000	45100	50000	54900	51000	56900	62800	52000	57900	63800	54000	59800	65700
	0.2618	39200	43200	47100	40200	45100	50000	42200	47100	52000	46100	51000	55900	50000	55900	61800	57900	63800	70600	57900	63800	70600	59800	66700	73600
	0.3299	47100	52000	56900	48100	53000	57900	51000	56900	62800	54000	59800	65700	58900	65700	72600	67700	75500	83400	68700	76500	84400	71600	79500	87300
	0.4150	56900	62800	68700	57900	64700	71600	61800	68700	75500	65700	72600	79500	71600	79500	87300	82400	91200	100100	83400	92200	101000	86300	96100	105900
4 1/2	0.2709	40200	44100	49100	50000	55900	61800	55900	61800	67700	57900	63800	70600	62800	69700	76500	74600	82400	90300	78500	87300	96100	80400	89300	98100
	0.3370	45100	50000	54900	58900	65700	72600	65700	72600	79500	66700	74600	82400	73600	81400	89300	86300	96100	105900	92200	102000	111800	95200	105900	116700
	0.3799	50000	55900	61800	66700	73600	81400	73600	81400	89300	75500	83400	92200	83400	92200	101000	98100	108900	119700	103000	114800	126500	107900	119700	131500
	0.4299	57900	63800	70600	75500	83400	92200	82400	91200	100100	85300	95200	105000	94200	105000	115800	111800	124600	137300	115800	128500	141300	121600	135400	149100
	0.5000	66700	74600	82400	86300	96100	105900	94200	105000	115800	99100	109900	120700	110900	122600	135400	130500	145200	159900	134400	149100	163800	142200	157900	173600

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

6.3.11 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 using strap (chain) tongs is allowed for steady continuation of make-up without threads overlapping and high-quality assembly.

6.3.12 When making-up pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters), the first two turns shall be carried out manually, or strap tongs can be used (Figure 9). 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 9

6.3.13 Make-up rotation speed during connection make-up with the rotary tong shall correspond to the values specified in Table 6.

Table 6 – Rotation speed during make-up

Start of make-up (M_m ≤5% M_{opt})		End of make-up marks (rotation)
First two turns	Further turns	
Speed 2-5 rpm, Better manually	Speed maximum 10 rpm	Speed 2-5 rpm

6.3.14 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.

6.3.15 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 nominal pipe wall thickness.

After make-up of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters), the trace depth on pipe shall be not more than 0.0079 inch.

6.3.16 When using hydrotongs with back up, the following conditions shall be observed:

During the first rotations (better manually, using a chain tong), back up 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 up on lower pipe body (back-up installation on coupling is not allowed) and continue make-up.

If for make-up of thread connection hydrotong is used not equipped with back up which serves as an arrester it is required to use a mechanical universal tong with a fixing function on lower pipe body.

6..*3.17* 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 10). The final make-up torque values shall be within M_{min} to M_{opt} limits in order to reduce the probability of turning.

6.4 Inspection of thread connection make-up by make-up diagram

6.4.1 General requirements

6.4.1.1 The shoulder torque M_{sh} of thread shoulders (box shoulder and pin shoulder) shall be within the range between *5 %* and *80 %* of the optimum make-up torque M_{opt}.

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

6.4.1.3 Typical cases of make-up diagram shape non-compliance are shown in Figures 11 – 15.

6.4.1.4 If the make-up curve is of improper shape, giving rise to doubt in make-up correctness, break out the connection.

After break-out remove compound from the surfaces of external and internal thread connections and inspect them.

- If no surface damages and (or) shape distortion (decrease of inside diameter in the plane of pin and box shoulder, sagging on coupling inside surface) are observed, thread compound shall be applied on thread connections of pins and couplings again in accordance with the requirements of para 6.1, the settings of equipment, alignment of made-up pipes shall be checked, make sure there is no slippage of clamp jaws and make-up the connection again.

- If surface damages are observed and can be repaired in accordance with para 6.5.10 after repair thread compound shall be applied on pin and coupling connections in accordance with the requirements of 6.1, the settings of equipment, alignment of made-up pipes shall be checked, make sure there is no slippage of clamp jaws and make-up the connection again.

If the damages observed cannot be repaired it is necessary to reject the connection.

If the shape of the make-up diagram after re-make-up is similar to the shape of the first make-up diagram, the pipe shall be laid aside and make-up with another pipe shall be performed. The laid aside pipe is allowed to be used for further make-up if no damages are observed or the damages are repaired. Reapply thread compound of the appropriate type and quality, check the settings of equipment.

Pipes on which pin or coupling were made up three times with replacement of counter pipe and with make-up diagrams of a wrong form shall be rejected.

6.2 Make-up diagram when make-up is correct

6.4.2.1 If make-up is performed correctly and all the thread connection geometric parameters comply with the established requirements, the make-up diagram (Figure 10) clearly shows defined areas, which correspond to torque increase due to thread surfaces mating (area I), thread and thread seals (area II), thread, thread seals and thread shoulders (area III).

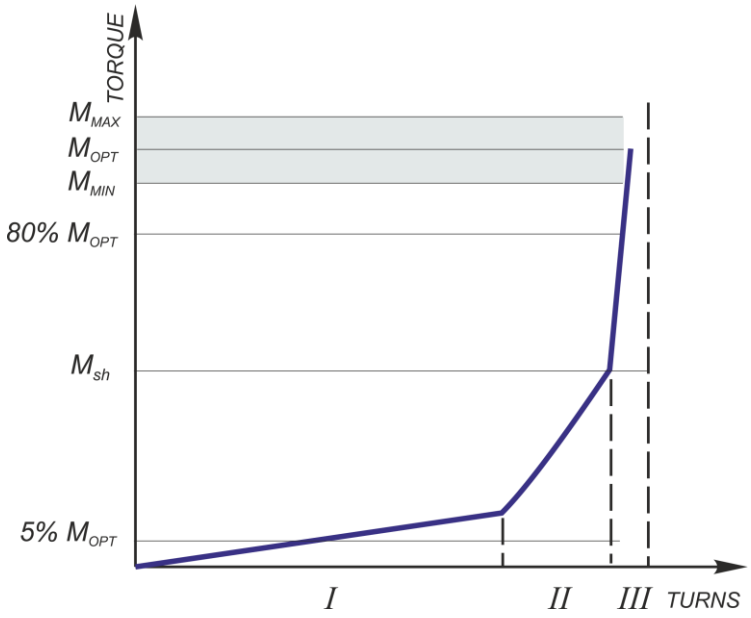


Figure 10

6.4.2.2 The torque increase on the first two revolutions corresponding to the initial mating of thread surfaces shall be smooth and even. Torque shall increase upon further mating of thread and guiding surface, mating of sealing elements. The moment of shoulder elements mating is followed by sharp increase of torque thus confirming correct process of make-up. Value of torque increase due to connection shouldering shall be at least 1000 Nm per 0,015 of rotation.

6.4.2.3 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.

6.4.3 Make-up diagram when torque increase stops

If the torque make-up increase and, horizontal section appears during the final make-up stage (area IV, Figure 12) and there is no slippage of the clamp jaws the actions shall be taken according to Para 6.4.1.4.

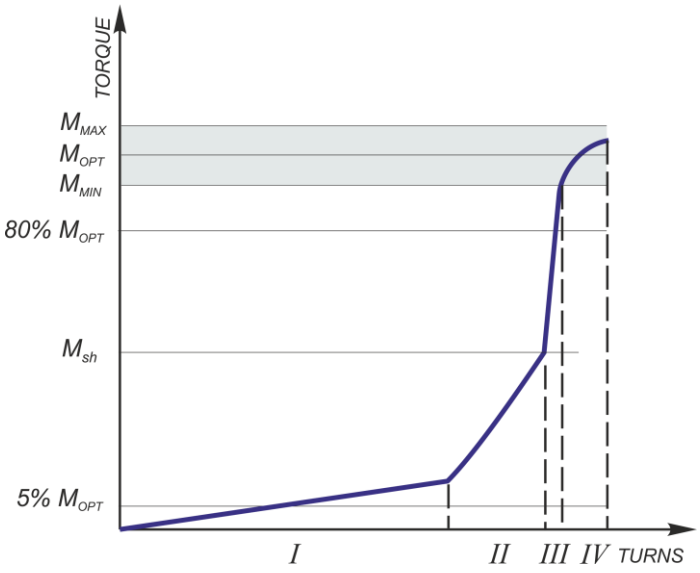


Figure 11

6.4.4 Make-up diagram when torque is low

Too low value of shoulder torque M_{sh} (below 5% of M_{opt}) on the make-up diagram (Figure 12) may result from:

- application of wrong type compound;
- compound contamination or its poor storage conditions;
- defects of load sensor.

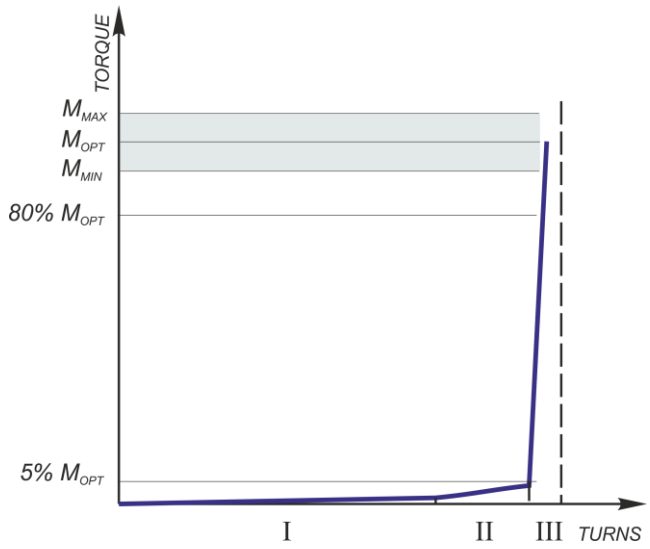


Figure 12

If the make-up curve is of improper shape, the following actions shall be taken according to para 6.4.1.4.

6.4.5 Make-up diagram when torque is high

Too high value of shoulder torque M_{sh} (over 80% of M_{opt}) on the make-up diagram (Figure 13) may result from:

- damage of thread and/or thread seals;
- improper thread cleaning;
- application of wrong type compound;

- thread compound contamination or high density of thread compound (for example, at low temperatures);

- defects of load sensor.

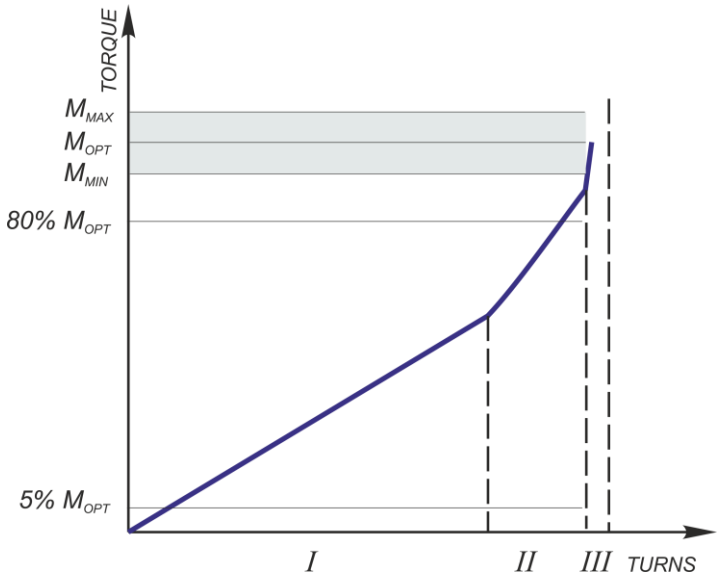


Figure 13

If the make-up curve is of improper shape, the following actions shall be taken according to para 6.4.1.4.

6.4.6 Make-up diagram with torque leaps

Torque leaps on the make-up diagram (Figure 14) may result from:

- uneven application of thread compound;
- misalignment of the equipment for make-up;
- misalignment of made-up pipes;
- Insufficient force of rotation on shoulder;
- slippage of clamp jaws.

Such a diagram is considered good and may be accepted according to requirements specified in. 6.4.2.3

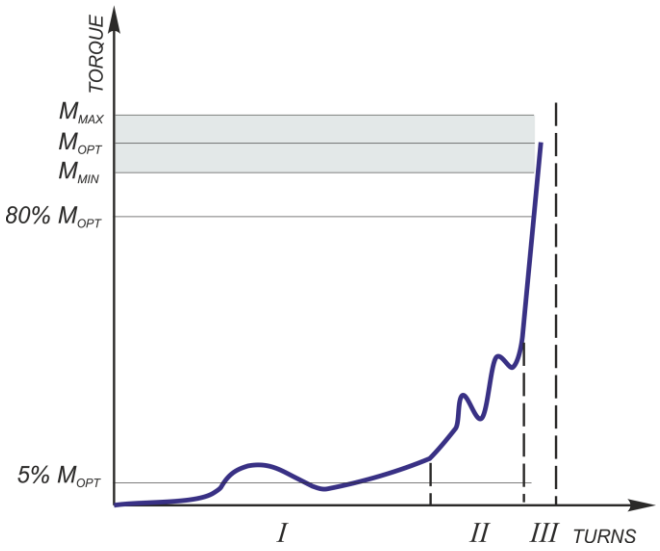


Figure 14

In case of any doubts concerning the make-up quality, the following actions shall be taken according to para 6.4.1.4.

6.4.7 Make-up diagram with a wave-like effect

Make-up curve with a wave-like effect (Figure 15), may result from:

- improper thread cleaning;

- thread compound contamination or high density of thread compound (e.g. at low temperatures);

- excess of compound.

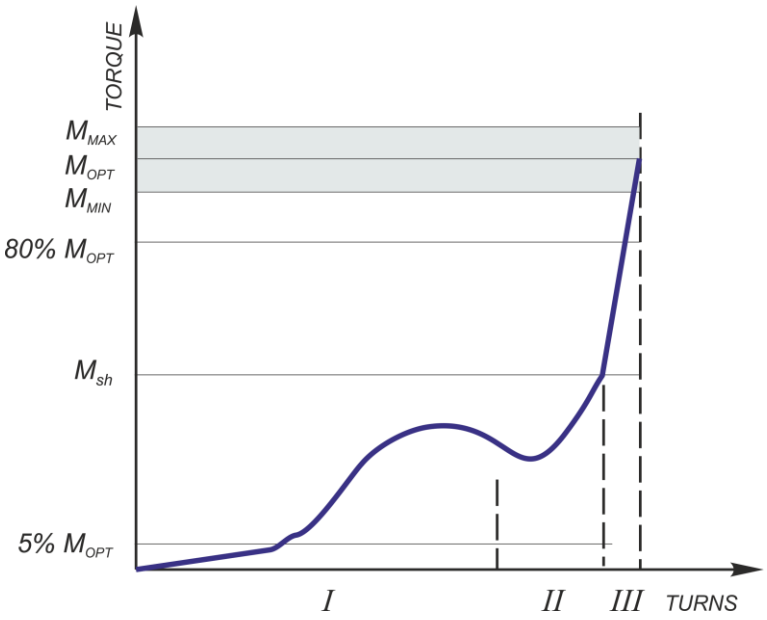


Figure 15

Such a diagram is considered good and may be accepted according to requirements specified in. 6.4.2.3

In case of any doubts concerning the make-up quality, the following actions shall be taken according to para 6.4.1.4.

6.5 Break-out of string

6.5.1 Prior to break-out, the rotary tongs shall be positioned as per Figure 5.

Prior to start break-out of connection hydro tong back-up shall be fixed on lower pipe body of a broken-out connection. If for break-out of connection hydro tong is used not equipped with back up or casing make-up system which serves as an arrester it is required to use a mechanical universal tong with a fixing function on coupling of lower pipe of a broken-out thread connection (fixing of back up on lower pipe body is not allowed, to exclude break-out of the mill connection).

6.5.3 When the string is being pulled out of the well, pin end faces are not allowed to hit against coupling end faces.

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

A driller fixes the weight on a hook load free, provides tension within 100÷150 кг (220.5÷330.7 lbs), and tries to maintain these values in the process of breaking-out. On the last turn pipe moving up shall be stopped in order to fix thread run-out (a click) and after that the pin shall be moved out of the coupling.

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

Reduce of thread connection break-out torque by 20% relative to the recommended optimum make-up torque M_{opt} is allowed.

6.5.6 Speed of connection break-out by rotary tong shall correspond to the speed, specified in Table 7.

Table 7 – Speed of thread connection break-out

Start of break-out		End of break-out
First two turns	Further turns	
Speed 2-5 rpm,	Speed maximum 10 rpm	Speed 2-5 rpm

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

The outer surface of couplings shall be free of damages with the depth larger than 0.5% of the couplings 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, the damage depth on the outer surface of pipes made from steels with the chrome content 3% and over (with grades containing Cr letters) and from chrome-nickel alloys (with grades containing Cr and Ni letters) shall be not more than 0.0079 inch.

6.5.8 When the string is disassembled, immediately after break-out or repair thread protectors shall be in-stalled immediately on pin and box thread connections.

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

– visual inspection of pipes and couplings body for significant mechanical damages (ref. 6.5.10);

– cleaning of external and internal thread connections from compound and contaminations (ref. para. 5.4);

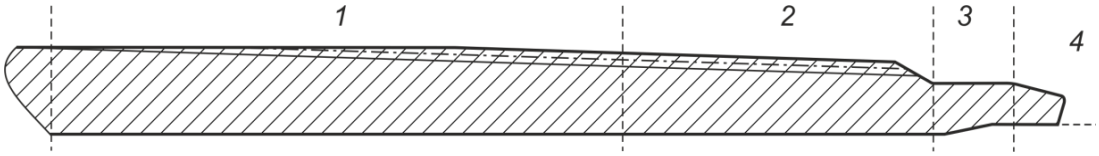
– visual inspection of thread, thread seals and thread shoulders surfaces of pins and coupling thread connections (see 6.5.10). In case of any damages detection, perform repair of thread connections or reject the pipes and couplings;

– cleaning of thread protectors from previously applied compound and contaminations (ref. para. 5.8);

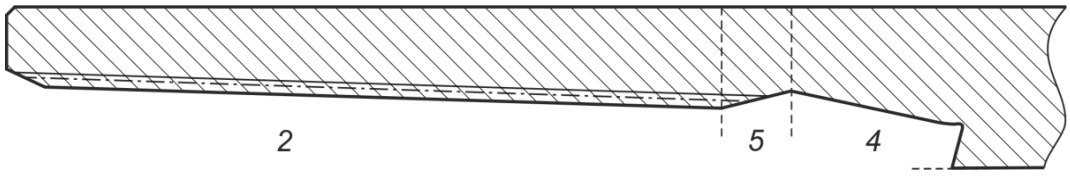
– application of storage compound Kendex OCTG, BESTOLIFE Storage Compound (BSC), Total Jet Marine, RUSMA storage compound, RUSMA - M3, RUSMA OCTG; or thread compound with storage properties on thread connections of pins and couplings and installation of thread protectors according to para. 5.8.

It is not allowed to store pipes and couplings thread connections wothout applied storage or thread compound and without thread protectors for more than 4 hours!

6.5.10 Possible types of damages of thread, thread seals and thread shoulders surfaces of pins and couplings after make-up/brake-out, as well as repair methods are specified in Table 10, figure 17.



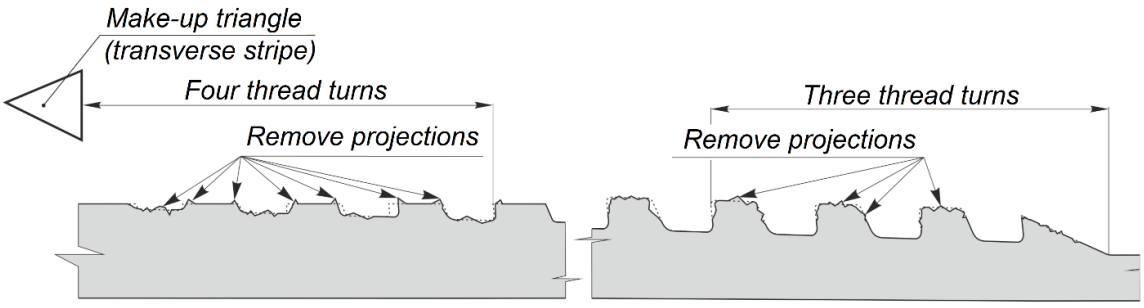
a) – Surface of external thread connection



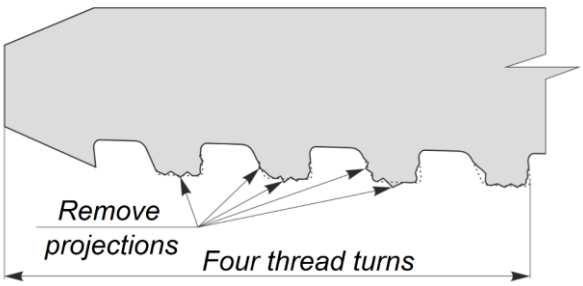
b) – Surface of internal thread connection

1 – imperfect profile thread; 2 – perfect profile thread; 3 – cylinder groove; 4 – seal and shoulders. 5 – tapered bore;

Figure 16



a) – Surface of external thread connection



b) – Surface of internal thread connection

Figure 17

Table 10 - Types of possible damages of thread connections surface after make-up - break out and methods of their repair.

Surface area (Figure 16)	Type of Damages	Extent of damage As per time allowed for repair, but not more than	Method of repair
1, 2	Irregularities Of profile (peaks and roots, figure 17)	Light damages which can be removed within not more than 10 minutes	Manual repair (removal of profile peaks up to the level of joining thread turn surface) using polishing paper with grain 100÷150 micron
		Moderate damages - which can be removed within not more than 10 minutes	Manual repair (removal of profile peaks up to the level of joining thread turn surface) using a needle file No.2, No.3, and polishing paper with grain 100÷150 micron for further treatment
		Severe damages - which can not be removed within 10 minutes	not to be repaired
1, 2, 3	Dents, nicks Tears, grooves and other defects	Light damages which can be removed within not more than 10 minutes	Manual repair (removal) using polishing paper with grain 100÷-150 micron
		Moderate damages - which can be removed within not more than 10 minutes	Manual repair (removal) using a needle file No.2, No.3, and polishing paper with grain 100÷-150 micron for further treatment
		Severe damages - which can not be removed within 10 minutes	not to be repaired
4	Grooves	Light damages - which can be removed within not more than 10 minutes	Repair (removal) by buffing
		Moderate and severe Severe damages - which can not be removed within 10 minutes	not to be repaired
	Dents, nicks Dents, nicks and other defects of any depth	Damages of any extent	not to be repaired

6.6 Make-up inspection by make-up triangle

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 near edge) on the pin with allowable deviation ±0.0394 inch

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7 Developer's warranty

Provided that the present recommendations are met, TMK UP PF thread connection shall withstand at least 9 make-up and break-out cycles preserving the same technical characteristics.

Annex A

(mandatory)

Inspection of alignment of pipes

A.1 General part

A.1.1 The present Annex contains requirements for alignment of pipes, meeting of the requirements is a basic criteria for successful make-up.

Proper centering (lack of misalignment and decline) is given in Figure A.1. (not taking into account horizontal make-up).

Note: please, do not confuse centering of drilling rig and alignment of made-up pipes.

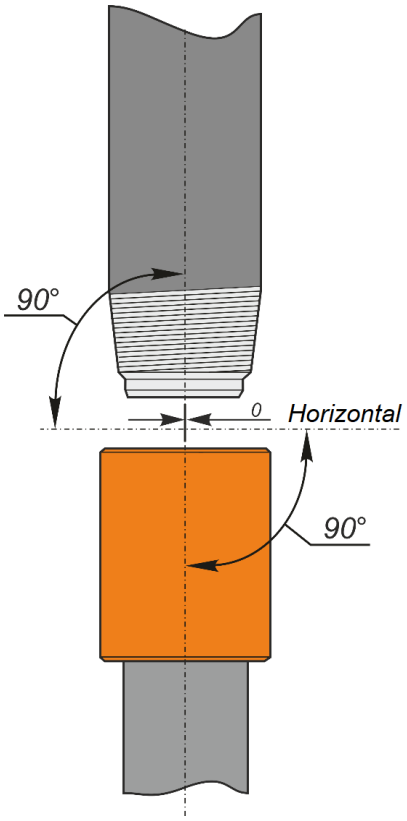


Figure A.1

A.1.2 Before make-up it is necessary to carry out the procedure of centering of drilling rig relative to the wellhead (centering relative to rotor is allowed) using the pipes subject to running.

A.2 Inspection of vertical deviation

A.2.1 Inspection of lower pipe vertical deviation

Lower pipe vertical deviation can be caused by deviation of the string during gaining in weight or inclination of drilling rig.

A.2.1.1 Before and during make-up it is necessary to carry out inspection of lower pipe vertical deviation according to figure A.2, through every 90° (±5°) in two planes.

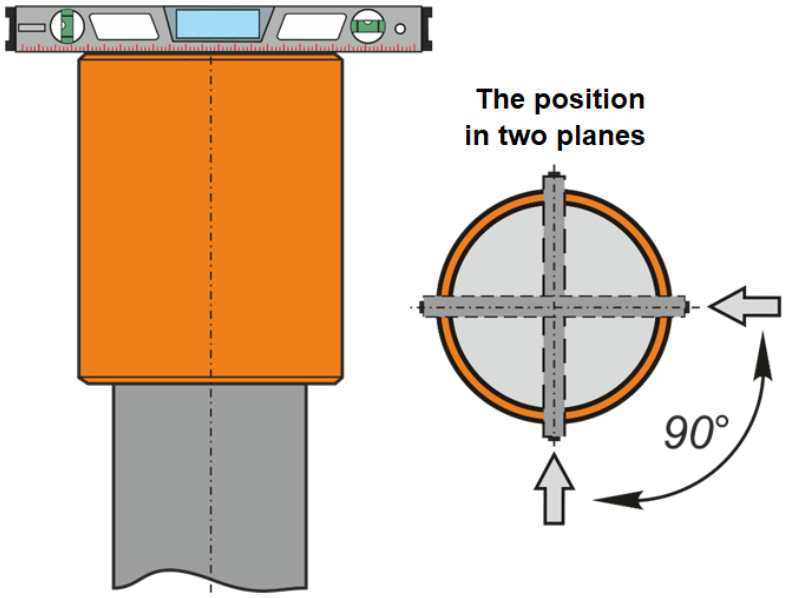
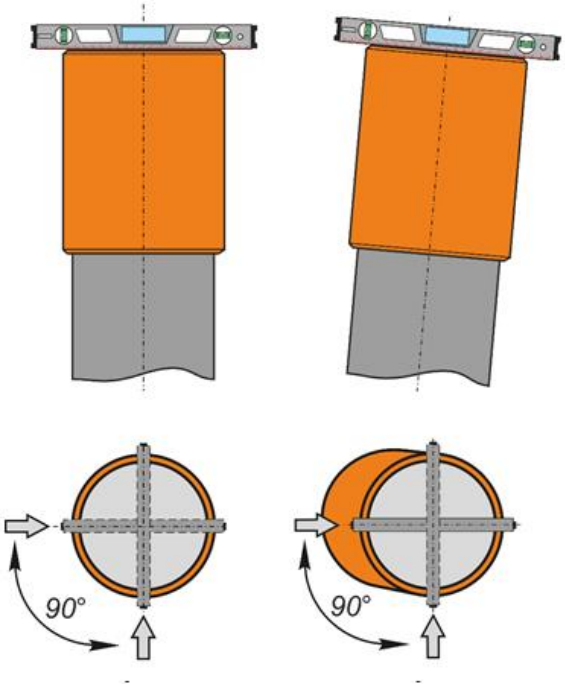


Figure A.2

A.2.1.2 During inspection in the first of the planes the lower pipe can be in vertical position (figure A.3 a).

A.2.1.3 During inspection in the second of the planes the lower pipe can be in the position with vertical deviation (figure A.3 b).



a) b)

Figure A.3

A.2.1.4 If the lower pipe is in the position with vertical deviation, it is necessary to adjust the position of the lower pipe till the deviation is corrected.

Correction of the lower pipe is carried out by centering of drilling rig or by any other available method.

A.2.2 Inspection of position of the upper pipe relative to the lower pipe

Proper position of the upper pipe relative to the lower pipe is given in figure A.4.

A.2.2.1 Position of the upper pipe relative to the position of the lower pipe shall be inspected through every 90° (±5°) in two planes according to figure

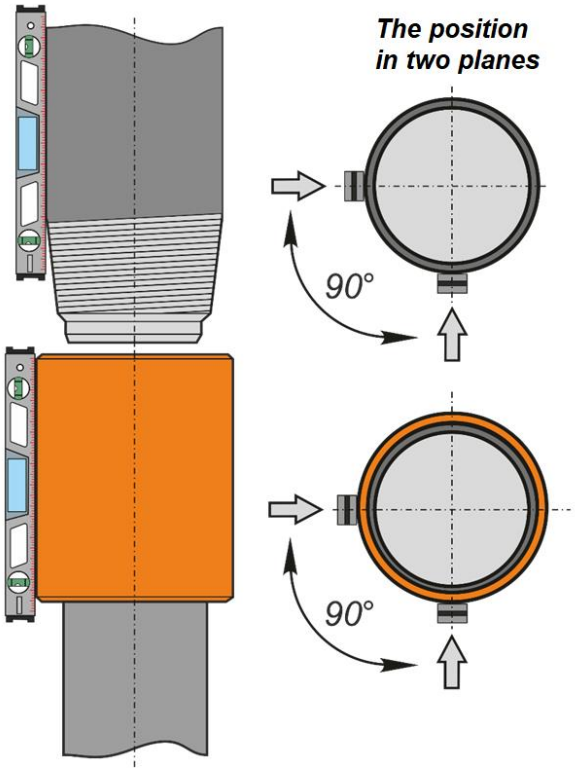


Figure A.4

A.2.2.2 During inspection in the first of the planes the upper pipe can be in vertical position.

A.2.2.3 During inspection in the second of the planes the upper pipe can be in the position with vertical deviation.

A.2.2.4 If the upper pipe is in the position with vertical deviation, it is necessary to adjust the position of the upper pipe till the deviation is corrected.

A.3 Inspection of misalignment

A.3.1 Inspection of misalignment of made-up pipes is carried out before make-up using measurement instruments:

- in horizontal plane (parallel displacement) using a ruler in the area with the largest deviation of the pipe from the coupling (Figure A.5); the value obtained shall not exceed 0.7874 inch;

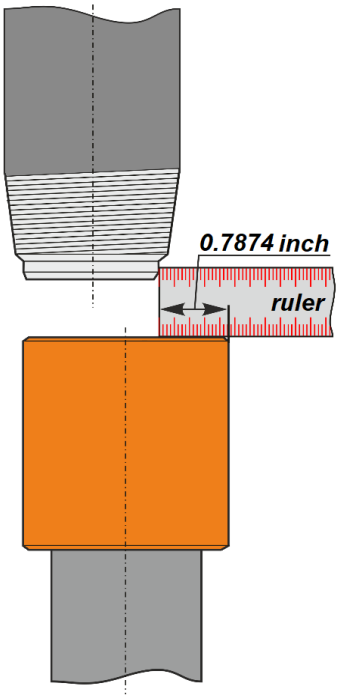


Figure A.5

- in vertical plane (angular displacement) from pin end face to coupling end face using a caliper in one plane (two measurements) (Figure A.6).

Maximum difference between the values of two measurements in one plane (L_1 and L_2) shall not exceed 0.0591 inch.

Misalignment of pipes is eliminated according to para 6.3.4.

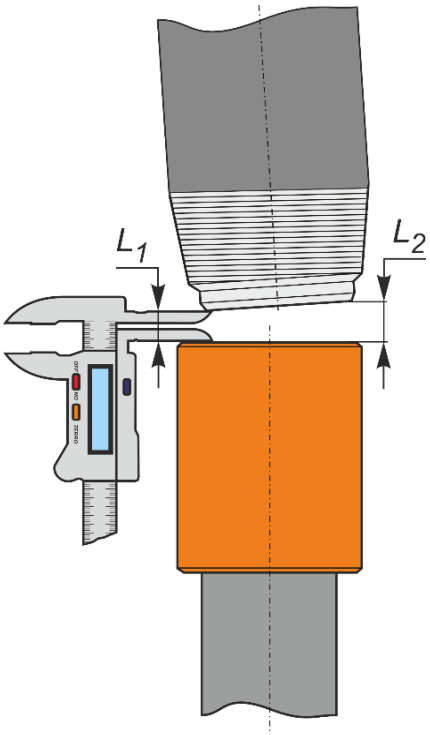


Figure A.6

A.3 Inspection of pipe decline

A3.5 If it is impossible to carry out inspection of alignment of pipes using measuring instruments before make-up, It is allowed to carry out visual inspection for lack of decline during make-up (Figure A.7).

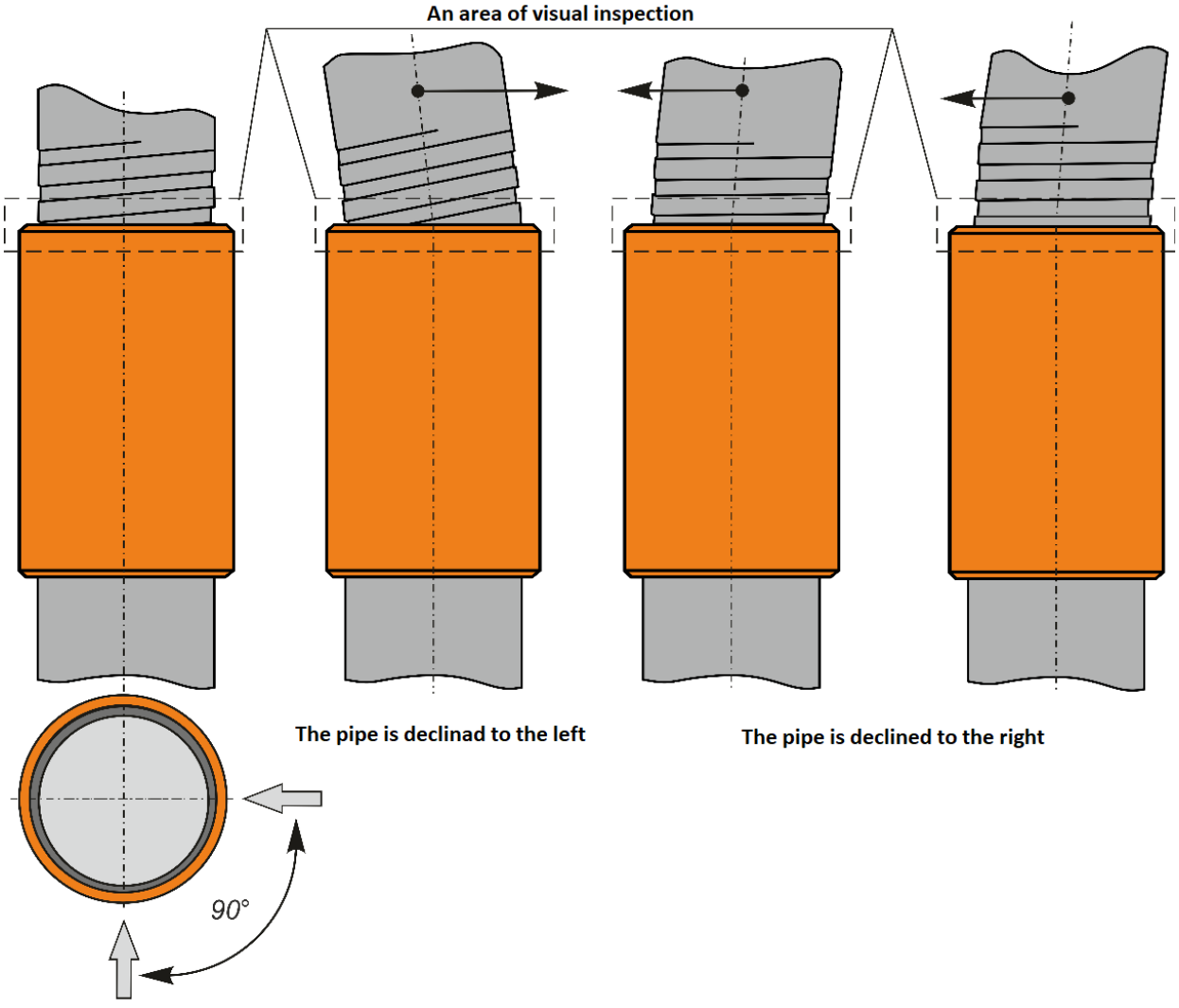
If thread turn in the root or in the crest touches coupling end face from the left side in one point and from the right side thread turn in the root or in the crest touches coupling end face in the second point, the position of pipe is deemed to have proper alignment in one of the planes.

Alignment shall be inspected through every 90° in two planes according to figure A.7a).

If thread profile root or crest touches coupling end face from the left side, and another thread turn root or crest touches coupling end face from the right side, the pipe is declined to the right, figure A.7b).

If thread turn in the root or in the crest is parallel to coupling end face, the pipe is declined to the right, figure A.7c).

Decline of pipes is eliminated according to para 6.3.4.



a) b) c)

Figure A.7

Annex B

(mandatory)

Equipment for make-up registration

TMK UP PF 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 make-up curve is plotted by torque values linear scale (vertical axis) and the number of revolutions (horizontal axis), which shall be linear scaled. Only last two revolutions are recommended to be recorded on the diagram, since torque increases at make-up completion.

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

- sufficient resolution (at least 800×600 pixels) for accurate display of the curve profile. The display screen shall be with the diagonal size of at least 9.8425 inch, and the make-up curve shall occupy at least 80 % of the screen area;

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

– display of minimum and maximum shoulder torques as horizontal lines;

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

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

- date and time display for each make-up;

– availability of comments;

- display of customer's name, well number, pipe outside diameter and wall thickness, weight; grade, thread connection type, thread seal compound data, and pipe manufacturer's name;

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

– 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 C

(mandatory)

Requirements to safety upon operation of tubing

C.1 Safety Ensuring

Measures to ensure safety during tubings operation, including their putting into operation, technical maintenance, all types of repair, periodical diagnostics, tests, preservation are determined by the company that uses the equipment, consisting of tubings.

C.2 Specified service life rate

The specified service life of tubings shall be at least 365 days and nights since the moment of their putting into operation subject to compliance with the requirements of the present guidelines for use.

When the service life of tubings is expired, the decision on their inspection and determination of new service life is made by the company that uses the equipment consisting of tubings.

C.3 List of critical failures

Critical failures during tubings operation are loss of tightness and thread connection or pipe integrity as a whole.

Critical failures may result from actions of the personnel connected with maintenance of the equipment, consisting of tubings, and related to the non-compliance with the requirements of the present guidelines for use.

C.4 Actions of personnel in case of failure or accident

In case of critical failure or accident the personnel connected with maintenance of the equipment, consisting of tubings, shall perform the following actions:

- inform the executives about failure or accident immediately;
- take measures to eliminate failure or accident and inform the executives about it.
- after elimination of failure or accident it is required to report briefly and exactly on the incident in the operator shift log, specifying the place, reason of failure or accident, measures taken to eliminate them.

Works on elimination of failure or accident shall be performed according to the plan worked out by the company which uses the equipment, consisting of tubings.

C.5 Criteria of limit states

C. 5.1 Wall thickness loss and internal surface state

The key factors which determine the limit state of tubings are considered to be wall thickness loss and internal surface state.

Decrease in pipe wall thickness is stipulated by metal loss usually on pipe internal surface as a result of mechanical wear or galling, caused by abrasive effect of extracted products. Decrease of pipe wall thickness loss may result in uniform pipe wall wear or local mechanical damages.

Deterioration of pipe internal surface state is stipulated by corrosion environmental exposure, under conditions of which recovery is performed.

Maximum allowable pipe wall thickness loss (prior to decommissioning) - is 85 % of the nominal wall thickness.

C.5.2 Evaluation of validity

Evaluation of tubings validity for further operation requires inspection of the wall thickness loss and pipes internal surface state to determine resistance to crumple, burst, tensile and corrosion effect, and shall be performed in compliance with the regulatory documentation on pipes.

C.6 Decommissioning and utilization

Decommissioning of pipes shall be performed by the company that uses the equipment, consisting of tubings, if the casings limit state criteria, specified in para 5.5, B,2 and B.5 of the present guidelines for use, are achieved. Decision on utilization of tubings shall be made up depending on the terms and conditions of well abandon.

C.7 Employee qualification

Employee involved in maintenance of the equipment, which includes tubings, shall have professional training of not lower than advanced education.

Prior to putting pipes into operation the employee shall be acquainted with the casings specifications and with the present guidelines for use.