Caspian Pipeline Consortium

Instruction 102
Mechanical/Process Equipment and Piping Isolation

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1. INTRODUCTION

1.1. In order to prevent injuries or unsafe conditions, this Instruction defines requirements to isolate the process medium (oil, gases, fuel or other hazards) and prevent it from getting into CPC mechanical and process equipment, pipeline and piping (pump stations, Tank Farm and Marine Terminal), which have been opened for inspection and repairs.

1.2. This Instruction has been developed in accordance with the CPC Safe Working Practices Regulations and Policy.

1.3. The requirements set out herein shall be observed by CPC staff and personnel of contractors regardless of their form of incorporation and departmental subordination carrying out maintenance and repair work on the process equipment of oil and gas pipelines operated at CPC locations.

Roles and responsibilities of work supervisors and workers, as well as safe working procedures are described in CPC Instructions #101, 105, 107, 108.

1.4. CPC regional managers shall be responsible for implementing this Isolation Instruction at respective CPC locations.

1.5. This Instruction refers to:

- ✓ Instruction #101 General Permit to Work.
- ✓ Instruction #108 Gas Hazardous Work Safety.
- ✓ Instruction #105 Hot Work Safety.
- ✓ Personal Protective Equipment Instruction.
- ✓ Instruction #103 CPC Electric Equipment Lockout/Tagout.
- ✓ CPC VRD 102.02.2010. Philosophy of Mechanical/ Process Equipment Isolation for Maintenance and Emergency Response Purposes.
- ✓ CPC VRD 113-23-2012 Procedure for Checking Pipeline Valve Condition and Identification of Criteria for Acceptable Level of Oil Leakage Through Valve Closure Element.
- ✓ GOST 22815-83 Pipeline Subassemblies and Parts. 10 – 100 MPa (100—1000 kgf/cm2) Flange Blinds. Design and Dimensions.
- ✓ GOST 22790-89 Pipeline Subassemblies and Parts 10 – 100 MPa (100—1000 kgf/cm2). General Technical Specifications. (GOST 22790-89 will not be used in the Russian Federation from May 1, 2014, when GOST 55599-2013 is to be enacted. Rosstandart Resolution No. 891-st dated 06/09/2003).

2. TERMS AND DEFINITIONS

2.1. Blinds – Metal blinds (normally steel) are designed to temporarily or permanently shut off the process medium flow in a pipeline. The blind thickness depends on its diameter, pressure and material. Depending on design and fastening method there are:

a) Flange Blind is a disc with a circular bearing surface and bolt (stud) holes through which the blind is fastened to a flange.

b) Skillet Blind (paddle blind or spade blind) is a type of blind used to temporarily and securely isolate a pipeline section and shut off process medium flow by installing it in between flanges. Normally, the skillet blind has a radial handle (tail) and may have a matching spacer which is similar to the skillet blind except that it has a hole in the middle for normal operation.

c) Spectacle Blind (reversible blind) is another type of blind consisting of two discs joined together. One of the discs is a solid plate and the other is a ring, which are installed in between flanges. Process media flow is shut off by installing the solid plate between the flanges and normal operation is made possible by rotating the blind and installing the ring between the flanges. It is like a skillet blind and spacer in one piece.

d) Elliptical (spherical) Blind is used to blank off (fully seal) pipeline ends. The elliptical blind is welded to the pipe.

2.2. Double Block and Bleed (DBB) means blocking the line at two points and draining the section in the middle to provide positive isolation. It is not as effective as blinding, but it is better than using only a single block valve. Below are two ways of achieving DBB.

a) Double block valves with a drain in between means two block valves installed on a pipeline section with a drain valve in between them, which allows the process medium to be drained from this section.

b) A Double block and bleed (DBB) valve is a valve, in which the cavity within the valve is isolated from the pipeline by seats on both sides with the valve in OPEN and CLOSED positions. Such design allows checking if the closure assembly seals off using a drain or vent with the valve in the CLOSED position.

2.3. Block valve means a valve designed to block the process medium flow in the pipeline with certain tightness (as per GOST R 52720). Block valves of the following designs may be used on the pipelines:

a) Wedge valve means a valve with sealing surfaces of closure located at an angle to each other and with closing or regulating element made in the form of a wedge (GOST R 52720).

b) Slide valve means a valve with closure in the form of a disc. Valve closure moves along sealing surfaces of body seat and perpendicular to the process medium flow. This type refers to parallel valves, the design of which provides for sealing surfaces to be located parallel to each other. Slide valves with expanding closure ensure double isolation. Tightness of contact between closure assembly and seats is regulated by rod travel extent: the more pressure on the rod, the more closure expands due to mobility of closure assembly elements with respect to each other and the more pressure is exerted on seat rings.

c) Ball valve means a valve with closing element of a spherical form (as per GOST R 52720). Closure assembly is usually made as double block and bleed. This design of closure provides for isolation of internal cavity between body and blind from pipeline by seats on both sides in open as well as closed positions, thus enabling:

- draining, flushing, purging of valve internal cavity,
- leak control of closure via drain and deaeration pipeline.

d) In addition, a cork (conical/gate) double seal valves, sleeve valves, disk valves, small needle or vent valves might be used.

2.4. Leak (poor tightness of closure) means existence of liquid exchange between media

separated by closure.

2.5. Closure leak control means technical control of the extent of test substance leak through closure.

2.6. Work Execution Plan (WEP) means a key document containing technical specifications and rules, HSE requirements, in accordance with which the work is planned, optimum work timing and necessary resources are determined, potential risks are assessed and responsible persons are assigned.

2.7. Blind Installation/ Removal Log means a technical document intended to record the time and location of blind installation and/or removal.

2.8. Confined Space - A confined space:

- has limited or restricted means for entry or exit,
- doesn't have sufficient ventilation and is not designed for continuous personnel occupancy,
- is where serious injury can occur from hazardous substances or conditions within the space or nearby (i.e. lack of oxygen, flammable gases, hydrocarbons, steam, etc.).
- Confined spaces include tanks, manholes, pits, process vessels, pipelines, narrow worksite passes etc.

3. MAIN EQUIPMENT ISOLATION PROVISIONS

For repair and inspection of mechanical, process equipment and piping requiring such to be opened, the work safety is ensured through isolating the process medium and preventing it from entering the work area by way of the methods listed below:

3.1 Blinding (CPC's preferred method of equipment isolation)

a) Isolation means must be installed and removed on the instruction of Work Supervisor or Location Manager (in accordance with Safe Working Practices or WEP requirements).

b) Installation and removal of blinds on running process equipment and pipelines are considered gas-hazardous work and must be performed against a Permit to Gas-Hazardous Work enclosed with blind installation schematics drafted by Work Supervisor and signed by PS/ MT Manager.

c) Blinds can be installed or removed only after all preparatory safety steps envisaged by Permit to Work have been completed. Work not specified in the Permit to Work is not allowed.

d) Installation and removal of blinds is recorded in the Blind Installation/Removal Log against the signature of the person, who has installed and removed them, as well as in the Shift Supervisor Operations Summary.

e) Blinds must be installed after the block valves on either side of the isolated flange have been closed and drained/purged.

f) Blinds must be selected in accordance with the category, type and size of the item to be isolated. Blind material must be selected in accordance with the CPC Pipeline Material Specifications.

g) Blind series and operating pressure must meet (not be less than) the test pressure of the isolated section. To make sure the blind sits tightly a standard spiral-wound metal/graphite seal of adequate size and pressure category should be used.

h) The blind thickness is determined based on the maximum pressure but must not be less than 3 mm. Nominal parameters of the blind must not be lower than those of the pipe. The skillet blind must have a tail protruding from the flanges. Each removable blind tail (or if not available - the blind cylindrical surface) must have a stamp designating the blind number (lot), rated operating pressure and diameter.

i) Quality of blinds must be confirmed with a certificate. It is allowed to have one certificate for one lot of blinds. A lot is a number of blinds manufactured from one material under one order. Permanent blind certificates must be kept in Blind Installation/ Removal Log.

j) 10 – 100 MPa spade blinds must be manufactured in accordance with GOST 22815-83, GOST 22790-89, ANSI/ASME B 16.5, ANSI/ASME B 16.47 and API 6A. Spade blinds with different parameters (not 10 – 100 MPa) can be manufactured using detailed drawings. (GOST 22790-89 will not be used in the Russian Federation from May 1, 2014, when GOST 55599-2013 is to be enacted. Rosstandart Resolution No. 891-st dated 06/09/2003).

3.2 Double Block and Bleed - Closing two block valves on one pipeline section, draining the process medium and monitoring the pressure between them.

a) For CPC, the preferred method of isolation is blinding. However, when blinding is not practical, it is acceptable to physically isolate the work site from a running pipeline (for example, remove a spool piece see section "d" below) or use two block valves to close the line between the work site and the potential energy source. At the same time the bleed valve shall be opened and periodic pressure control shall be constantly monitored at the closed section.

b) Operator must ensure that both block valves are secured in the closed position with a chain and lock and have the yellow DANGER – DO NOT OPERATE tags on.

c) The bleed valve (drain valve) in between the block valves must be opened to drain, degas and depressurize the equipment. Operator must make sure that the bleed valve is not clogged and that all liquid, gas and pressure have been fully bled from the isolated pipeline section.

d) Operator must check the block valves for tightness. If they do not hold, Operator must close, chain and lock the block valve upstream the process medium and bleed pressure and drain the process medium from the isolated pipeline section.

e) The bleed valve (drain valve) must be locked in the open position until the work has been completed. It must have the yellow DANGER DO NOT CLOSE tag attached. If the medium is drained via the bleed valve into a bucket it is necessary to make sure it is not overfilled.

3.3 Double Block and Bleed - Closing a double block and bleed valve, opening the bleed to allow continuous draining and monitoring the pressure inside the valve body.

a) This method of equipment isolation is similar and equivalent to option b above, but it uses a special double block and bleed configuration that is housed within a single block valve body. The allowable block valve tightness must be achieved and checked as per CPC VRD 113-12-2012. The valve must have the yellow DANGER DO NOT OPERATE tag attached.

b) The bleed valve must be locked in the open position until the work has been completed.

3.4 Spool Piece Removal

a) Spool piece removal is an excellent method of isolation whenever practical. It involves removal of a section of pipe to isolate the equipment being worked on from any process media.

b) Safe removal of a spool piece may also require the use of blinds and/or double block and bleed valves. . If the medium is drained via the bleed valve into a bucket it is necessary to make sure it is not overfilled.

4. GENERAL PRECAUTIONS

4.1. The precautions that need to be taken when working with a piece of equipment depend upon the intended purpose of the equipment and the nature of the work to be performed. The main safety precautions are described in Operating Manuals for each type of equipment and CPC Safe Working Practices Instructions #101, 105, and 108. In case the work to be performed is not covered by the said documents, Work Supervisor jointly with Location Manager must work out a detailed work execution plan (WEP) indicating hazards and safety measures to be also included in a relevant Permit to Work.

4.2. When formalizing Permit to Work, the safety precautions described herein, CPC Safe Working Practices, as well as other regulatory documents and technical standards pertaining to the type of work must be taken into account.

4.3 All block valves which should be in “closed” or “open” position as part of the equipment isolation procedure must be de-energized (electric drives), locked out in the proper position. Some block valves may be designed to accept a padlock, but others may require a chain and lock to secure the closure position. Lock out is critical to isolation to ensure that the valve is not opened or closed before work has been completed. Tags or signs may not be substituted for locks. The keys to all locks must be controlled by the Work Supervisor. Each site should have an adequate number of locks, chains, tags and other equipment needed to comply with this instruction.

4.4. A CPC location is prepared for isolation of mechanical/ process equipment and piping, i.e. block valves are closed or opened and locked out, by the location Operations and contractor personnel led by Preparatory Work Supervisor.

4.5. When preparing for mechanical/process equipment and piping isolation, Location Manager jointly with Work Supervisor (if any) and/or Preparatory Work Supervisor, must determine dangerous area, which boundaries are to be clearly marked with relevant placards and warning signs, as well as access control measures to prevent unauthorized persons from entering the work area.

4.6. Prior to work performance, the block valves on each side of the isolated section are checked for tightness, the equipment to be opened and all its energy sources (for example, pumps, air compressors, steam generators, hydraulic system, electrical system, compressed gases, etc.) and other pipeline sections are isolated, block valves are locked in the opened or closed position.

4.7. When preparing to begin isolation, the availability and condition of PPE, tools, accessories and other safety means are checked. Workers must take a safety briefing and their skills in using PPE, applying safe working practices and rendering first aid are checked.

4.8. Prior to commencement of mechanical equipment and piping isolation all other types of work (construction, installation, etc.) must be stopped and all ignition sources within a radius of 15 meters from the work area must be removed. Special measures should be taken to eliminate possible process medium leaks or gas releases and, if any, prevent them from combustion.

4.9. Pipe ends, piping elements vented to atmosphere or taken out of service must be always sealed off, plugged (with special threaded plugs) or removed save for the instances described in Items 3.2 (e) and 3.3 (b).

5. EQUIPMENT OPENING PRECAUTIONS

5.1. At all times assume that the equipment is pressurized. Do not rely on a pressure gauge, even if it reads "zero". The pressure gauge may be plugged or defective.

5.2. Location Manager, Operations personnel and Work Supervisor must make sure that the equipment has been depressurized.

5.3. Having emptied the equipment, open the drain valve to remove any process medium that might remain at low points of the equipment.

a) Open block valves and drain valves slowly until absolutely sure that no positive pressure is present in the equipment or line.

b) If a drain valve is not available or it is impossible to fully bleed pressure and drain process liquid from the work area, loosen the bottom-most bolts (or bolts on the side opposite to where people are located) of the flange closest to the work area. Then loosen other bolts. Slightly spread the flange to depressurize the line.

c) Drain the process medium into a suitable container avoiding spilling it on the ground or pavement. *Any material that is spilled on the soil or outside of containment must be reported as an environmental incident and the spilled material and contaminated soil must be cleaned up and disposed of properly.*

5.4. Before removing a pipeline section (valve, spool piece, etc.), install a bond wire (jumper) connecting the line ends to be separated to prevent stray electrical currents from arcing:

a) Use standard bonding clamps and a copper wire or copper strip having a cross-section of at least 25 mm^2.

b) Provide a positive secure metal-to-metal contact; to then end, clean the contact surfaces until shiny. Having installed the jumper, take electrical resistance measurements.

c) The jumper must remain in place until the line is reconnected.

6. INSTALLING/ REMOVING BLINDS

6.1. Gaskets must be installed on both sides of the blind. If this is not possible, a gasket must be installed on the pressure side of the blind. The gasket material must be selected to meet the operating conditions of a specific pipeline/ equipment. The blind must have a protruding part (tail), by which you can tell if the blind is installed

6.2. If the blinds create dead ends in the pipelines it is necessary to monitor pressure in such locations (especially in summertime when the thermal pressure may increase)..

6.3. Install blinds on all lines going to the work area and in the flanges closest to the work area. If a pipe spool (or equipment piece with several flange connections) is removed to isolate the equipment, blinds must be installed on all flanges opened following the spool (equipment piece) removal.

6.4. Small-diameter piping can be isolated by disconnecting the closest union, offsetting and capping (plugging) the pipe. The pressure side of the joint is sealed off with a tagged (yellow DANGER DO NOT OPERATE) plug or cap.

6.5. Unbolt (break out) flange connection fasteners carefully making sure no metal gaskets and other materials fall out of the flange connection. Start unbolting from the bottom-most stud. Remove the old gasket.

6.6. Inspect the blind visually prior to installing it. Confirm that the blind is the correct one for service and location and that it is in good condition. The blind should not be warped or corroded and it should have a smooth flat sealing surface.

6.7. Rotate the reversible blind around either a fastening stud (bolt) or a flange spreading bolt installed in one of the flange threaded holes.

6.8. When installing the blind/pin, tighten the bolts gradually, in turn in diametrically opposite fashion (as per the attached scheme).

Bolts must be of proper length (there must be at least one pitch of thread above the nut) factoring in the extra length needed for a blind. All nuts must be located on the same side of a flange connection. Pins shall be located symmetrically on a flange connection. It is disallowed to install bolts and pins on the same flange.

6.9. Having completed the work on blind installation, the crew must clean the work area and remove tools, accessories, etc.

7. CONFINED SPACE ISOLATION

7.1. Whenever a person is going to enter a tank, vessel, equipment, pit or other confined space, all pipelines going to and out of the confined space must be isolated with blinds. Blinds must be installed as close to the confined space as possible. Whenever possible, a spool piece should also be removed to guarantee positive isolation. Depending on the type of work, follow Instruction #108 Gas Hazardous Work Safety and Instruction #105 Hot Work Safety which specify special mandatory confined space requirements.

ATTACHMENT 1. CHANGE RECORD PAGE FORM

Rev. #	Sheet (page) numbers				Total document sheets (pages)	Change Notice #	NAME, Signature	Date	To be effective
	Amended	Superseded	New	Canceled					