



APPROVED
General Director

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INSTRUCTION No. 107
SAFE EARTHWORK
AT CPC SITES

Revision No. 3

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1. PURPOSE

This Instruction sets forth requirements for safe earthwork arrangements and procedure at CPC hazardous industrial facilities.

2. SCOPE

The Instruction shall apply to performance of earthwork at hazardous industrial facilities as well as within their exclusion zones performed by CPC and contractor staff if a services agreement is in place between legal entities in accordance with the legislation of the Russian Federation and the Republic of Kazakhstan.

3. REGULATORY REFERENCES

References to the following regulatory documents are used in this document:

Table 1. List of Regulatory Documents

#	Regulatory Documents
1	Statutory
1.1	Federal Norms and Rules in the Sphere of Industrial Safety Rules of Safe Performance of Gas-Hazardous Works, Hot Works and Repair Works approved by RTN Resolution No. 485 dated 25.11.2017
1.2	Federal Norms and Rules in the Sphere of Industrial Safety Safety Rules for Hazardous Industrial Facilities of Trunk Pipelines approved by Resolution of the Federal Service for the Supervision of Environment, Technology and Nuclear Management No. 520 dated 06.11.2013.
1.3	Occupational Safety Rules in Construction approved by Resolution of the Ministry of Labour and Social Protection of the Russian Federation No. 336H dated June 01, 2015
1.4	Construction Norms and Regulations SNIP 12-03-2001 Occupational Safety in Construction. Part I. General Requirements
1.5	Construction Norms and Regulations SNIP 12-04-2002 Occupational Safety in Construction. Part 2. Construction Operations
1.6	Rules of Fire Prevention Regime in the Russian Federation approved by Decree of the Government of the Russian Federation No. 390 dated April 25, 2012
1.7	GOST 12.0.003-2015 Occupational Safety Standards System. Dangerous and Harmful Production Factors. Classification
1.8	Rules of Industrial Safety for Hazardous Industrial Facilities of Oil and Gas Industry, Resolution No. 355 of the Minister of Investments and Development of the Republic of Kazakhstan dated December 30, 2014
1.9	Rules of Industrial Safety for Operation of Trunk Pipelines approved by Resolution No. 354 of the Minister of Investments and Development of the Republic of Kazakhstan dated December 30, 2014
1.10	Decree of the Government of the Republic of Kazakhstan # 1077 On Approval of Fire Safety Regulations dated October 9, 2014
1.11	SNiP RK 1.03-05-2001 Occupational Health and Safety in Construction Industry
2	Internal

#	Regulatory Documents
2.1	A02-OD-HSE-052, Permit-to-Work Procedure for Arrangements of Hot Works, Gas-Hazardous, Excavation, Repair and Other Hazardous Works
2.2	Instruction No. 104 Arrangement of Air Monitoring at CPC Facilities
2.3	CPC Instruction No. 108 Gas-Hazardous Work Safety Instruction at CPC Facilities
2.4	CPC VRD 61.10.2015, Regulation on Replacement of Defective Pipeline Sections and Piping Joints in CPC Pipeline System
2.5	CPC VRD 09.09.2014, Rules of Technical Operation of CPC Oil Transportation System
2.6	VRD 34.09.2014, Regulation on Work Arrangement within the Pipeline Exclusion Zone
2.7	Instruction No. 106 Safe Repair Work at CPC Sites

4. TERMS, DEFINITIONS AND ABBREVIATIONS

The terms and abbreviations used in this document are given in Table 2.

Table 2. Terms and Abbreviations

#	Term / Abbreviation	Definition
1	Terms	
1.1	Permit-to-Work	work assignment that is executed on a special template and defines work contents, work location, work commencement and completion time, safety conditions, team membership and persons in charge of safe work performance, etc. Permit-to-Work shall comprise supporting information confirming that all the risks have been identified, and all controls are in place to ensure safe work performance.
1.2	Earthwork	scope of construction and repair work that includes removal (excavation) of soil, shifting thereof and laying thereof to a definite location accompanied by leveling and compaction of soil in order to create engineering structures from soil, site leveling, as well as the removal of earth masses carried out by manual and mechanized method. Excavation of soil using manual or mechanized method from the depth of 0.3 m and greater shall be regarded as earthwork.
1.3	Customer	CPC, its regional subdivisions or its authorized representative depending on the context.
1.4	Contractor	an entity having a contract/services agreement with CPC or its authorized representative, depending on the context.
1.5	Procedure	A02-OD-HSE-052, Permit-to-Work Procedure for Arrangements of Hot Works, Gas-Hazardous, Excavation, Repair and Other Hazardous Works
2	Abbreviations	
2.1	RF	Russian Federation
2.2	RK	Republic of Kazakhstan
2.3	CPC	Caspian Pipeline Consortium

5. DESCRIPTION OF THE PROCESS OF EARTHWORK

5.1. Earthwork at the territory of CPC facilities includes works associated with the excavation of soil (excavation of pits, trenches).

5.2. The safety measures set forth by this Instruction, CPC regulatory acts that define the procedure for preparation and performance of hazardous operations as well as other regulatory and technical documents whose requirements pertain to this type of work shall be taken into account during performance of earthwork.

5.3. During performance of earthwork with workplaces located in pits and trenches it is necessary to provide for actions to prevent the impact of the following hazardous and harmful production factors associated with the nature of work on employees:

- cave-ins;
- falling objects (soil);
- moving machinery and operating parts thereof as well as objects moved;
- workplace being located near a height difference of 1.8 m and greater at the distance closer than 2 m from the boundary of the height difference in the absence of protective barriers or with the height of protective barriers of less than 1.1 m;
- high voltage in an electrical grid whose short circuit can occur through a human body;
- chemical dangerous and harmful production factors;
- other factors.

5.4. Should the dangerous and harmful production factors specified in Clause 5.3 hereof be present, the safety of earthwork shall be ensured by following the requirements contained in the organizational and process documentation for the performance of work:

- determination of safe slope of unshored pits, trenches (hereinafter, excavations) taking into account the load from construction machinery and soil;
- determination of the types and designs of shoring of the sides of pits and trenches, locations and technologies of their installation as well as locations of ladders for ascent and descent of people;
- selection of the types of machinery used for excavation of soil and the places of their installation;
- additional slope reinforcement measures due to seasonal changes;
- other activities.

5.5. Earthwork at the pipeline include the following:

- execution of land allocation (as required) and Permit-to-Work documents for performance of works within pipeline exclusion zone, approval of earthwork with the owners of the utilities located in the same technical corridor or those crossed by the pipeline (as required);
- marking of the pipeline route and positive identification and marking of other underground utilities in this technical corridor with identification signs;
- preparation of the area of repair work, auxiliary sites;
- arrangement of driveways for movement of vehicles at least 10 m away from the pipeline axis;
- arrangement of pipeline crossings equipped with reinforced concrete road slabs;
- excavation and arrangement of a repair pit;
- excavation of pits for tie-in of vents into the pipeline;
- levelling of ground on temporary pipeline route for crude oil pump-out/injection;
- backfilling of the repair pit, sumps;
- land reclamation at the area of repair work and turnover to land users or land owners with execution of an act.

5.6. Earthwork at CPC facilities may be performed by individuals at least 18 years old, who have passed medical examination and unless contraindicated to perform such work, have passed work safety, PPE and first aid training, due knowledge test and have been appropriately certified.

6. SAFETY REQUIREMENTS TO EARTHWORK PERFORMANCE

6.1. PREPARATORY WORKS TO EARTHWORK PERFORMANCE

6.1.1. Having received the Customer's Work Order for earthwork, the Contractor shall execute Permit-to-Work documentation in accordance with CPC VRD 34.12.2003 Work Arrangement within the Pipeline Exclusion Zone.

6.1.2. The Contractor shall perform the activities and submit the documentation specified in Exhibit 2 of Instruction No. 106 Safe Repair Work at CPC Sites.

6.1.3. Earthwork can be performed at CPC facilities only in the presence of a Permit-to-Work.

6.1.4. All the risks associated with performance of work shall be reviewed at the stage of development of permit documentation and activities to prevent them or minimize their impact during performance of work shall be developed.

6.1.5. The activities shall be specified in the work execution project/plan and in the Permit-to-Work.

6.1.6. The work execution project/plan shall define the excavation method, specific work sites, mechanisms and devices used, number of workforce, PPE, work schedule, resources and safety measures.

6.1.7. The list of persons in charge of organization and conducting hazardous works at CPC facilities is given in Section 10 of the Procedure.

6.1.8. Earthwork Permit-to-Work at CPC facilities shall be executed according to Exhibit No. 2 of the Procedure.

6.1.9. A stepwise diagram for the issue of work Permit-to-Works is specified in Exhibit No. 1 of the Procedure.

6.1.10. Prior to work start Permit-to-Works for performance of separate types of work shall be executed according to Exhibit 14 of the Procedure, depending on the scope of work.

6.1.11. Earthwork Permit-to-Works shall be recorded in earthwork Permit-to-Work log with assignment of a number according to Exhibit 10 of the Procedure.

6.1.12. During planning of earthwork as part of repair works a Permit-to-Work for performance of repair work shall be executed for the whole duration.

6.1.13. Utilities located within the earthwork site shall be indicated on a diagram, which is a mandatory attachment to the earthwork Permit-to-Work. The diagrams shall be agreed with the utility owners.

6.1.14. Prior to the earthwork, the axis and depth of the pipeline under repair, points of crossing with underground utilities, man-made and natural obstacles, and pipe bend angle vertexes shall be confirmed on the pipeline and marked with signs. The pipeline shall be marked within the work site boundaries (movement of vehicles, excavation of pipeline, arrangement of an oil pit, laying of field pipeline) with identification signs (boards with inscriptions) with a height of 1.5... 2.0 m from the ground, with indication of the actual depth, installed on the straight segments of the pipeline at least at 50 m intervals, where the terrain is uneven – at 25 m intervals. The locations of third party underground utilities shall be marked with 1.5... 2.0 m-high pegs at 10 m intervals on straight segments of the pipeline, at all points of deviation from straight pipeline route by more than 0.5 m, at all turns of the pipeline, and at the boundaries of manual digging of soil. Points where the pipeline crosses other companies' utilities should be marked with the signs specifying their depth of laying. Besides, identification signs should be installed in hazardous areas (boggy areas with a poor soil bearing capacity, etc.)

6.1.15. Prior to earthwork at the PS, loading terminal, MT with discipline specialists shall confirm the locations, depth of underground utilities at the earthwork locations. The location of the communications should be marked on the spot with the help of pegs on straight sections and at turning points.

6.1.16. Prior to earthwork, before soil excavation the work site should be fenced and marked with warning signs.

6.1.17. Prior to earthwork, the workers shall undergo a toolbox talk about fire and industrial safety measures and dangerous and harmful production factors at the work site.

6.2. REQUIREMENTS TO EARTHWORK PERFORMANCE

6.2.1. Earthwork should begin with stripping of a fertile soil layer and its relocation to a temporary storage site. The minimal width of a removed fertile soil layer should be the pit width plus 0.5 m on each side. If the fertile soil layer is less than 10 mm thick, it is allowed to do the earthwork without its removal.

6.2.2. Transportation, storage and refill of the fertile soil layer shall be performed by methods that prevent deterioration of its quality as well as its loss during shifting.

6.2.3. When excavating the pipeline, the soil should be excavated on both sides of the pipeline no closer than 0.20 m from pipe. The rest of soil should be removed manually with spades avoiding any sharp strikes against the pipe. The pit and trench sizing depends on the type of planned repair and should be determined based on respective regulations: CPC VRD 61.10.2015 Regulation on Replacement of Defective Pipeline Sections and Piping Joints in CPC Pipeline System.

6.2.4. In case of mechanized excavation, Work Supervisor should control the pipe finding at the beginning of excavations so that to determine its exact location and give instructions where to install the excavator and where it should move in the course of further pipe excavations.

6.2.5. At the places of pipeline crossing with existing underground service lines, it is banned to use the excavator for soil excavation closer than 2 m horizontally and 1 m vertically to such service lines. The rest of soil should be removed manually. When doing the earthwork in the immediate vicinity (under 0.5 m) to underground service lines, it is banned to use striking tools (crow-bars, hacks, pneumatic tools).

6.2.6. Safety measures similar to those described in 6.2.5 should also be observed in case the earthwork is done in the vicinity to existing underground service lines not related to the excavation of the pipeline.

6.2.7. Underground service lines found in the open pit should be protected, reinforced or, where required, removed to ensure safety of workforce.

6.2.8. In order to prevent soil parts from falling into the excavation, stockpiles of soil removed from the excavation shall be located at a distance of at least 1 m from the edge of the pit/trench.

6.2.9. Stockpiling of soil on the existing pipeline is forbidden.

6.2.10. Upon detection of any pipelines, cables and other underground service lines which had not been identified during the earthwork preparation, but were discovered in the course of excavations, Work Team Leader should suspend the work and inform Work Supervisor and Site Supervisor accordingly. The work should only be resumed after the line owners are found and the work is coordinated with them.

6.2.11. Suspension of work with evacuation of workforce from the hazardous area is also performed if any objects whose appearance allows to identify them as ammunition are found. In such case machinery and equipment shall remain at the work site. This incident shall be reported immediately to the Site Supervisor.

6.2.12. The earthwork site should be fenced and marked with warning and forbidding signs.

6.2.13. The workers should not stay close to vehicles being loaded or unloaded.

6.2.14. In case of using excavators or other vehicles near a pit or when it is required to move a vehicle closer to the pit edge, a spotter shall be appointed.

6.2.15. The spotter should arrange the vehicles so that they do not approach the pit edge too close, which may impair soil stability or cause the vehicle falling into the pit.

6.2.16. Vehicles, equipment and excavated soil should not be placed closer than 1 m to the pit edge.

6.2.17. During excavation of pits and trenches to a depth of more than 1 m measures shall be undertaken to prevent movement of soil/cave-ins (sloping and shoring).

6.2.18. When using a single-bucket excavator to excavate, the working face shall be determined by the work execution project/plan so that no soil “canopies” are formed in the process of work.

6.2.19. Workers are forbidden to approach the excavator buck operation zone closer than 5 m.

6.2.20. In the places where the earthwork may impair the stability of neighboring buildings, walls, storage tanks or other structures, it is required to use special methods of soil reinforcement, including stabilization of pit walls, spacer bars, foundation reinforcement or other means preventing such facilities from collapsing.

6.2.21. In the event of any traces of hydrocarbons or other chemicals (unidentified fluids, smell, oily film, etc.) in soil or borrow material the work shall be suspended, workforce shall be evacuated to a safe area and the Site Supervisor shall be informed.

6.2.22. Work shall be resumed after the causes of hazardous production factors affecting the work safety have been identified and eliminated and after air monitoring confirming the absence of hazardous substances at the earthwork site has been performed.

6.2.23. Works can be suspended by the workers both participating in the work process and the ones observing it by using their Stop Work Authority if in his/her opinion or judgment, such activity is deemed to be unsafe or done using an unsafe method and a risk for personnel, equipment or the environment is present.

6.2.24. Works shall be resumed after the identified non-conformities have been rectified. This observations shall be recorded.

6.2.25. On sections of the pipeline route with a lateral gradient of 8+ degrees there is a hazard of specialty equipment (excavator, bulldozer, etc.) overturning. Normal conditions for digging trenches or pits in such case may be assured by construction of a terrace (half-embankment/half-ditch). The type of such terrace depends on the slope steepness and soil nature, and it should be determined by the design for each case individually.

6.2.26. Excavations at the locations with a high groundwater level shall be performed with water level reduction by surface drainage, drainage methods. For water drainage in the pit a 1.0 × 1.0 m sump or 1.0 × 0.5 drainage ditch covered by sheeting, metal or wooden grating shall be arranged. The grating must have the mesh size that ensures safe conditions during performance of repair works in the pit. The repair pit shall be prepared during groundwater pumping and level reduction.

6.3. SAFETY REQUIREMENTS FOR EXCAVATION OF PITS AND TRENCHES

6.3.1. During placement of workplaces in excavations their sizes shall be sufficient to fit in structures, equipment, accessories, passages to the work places with the width of at least 0.6 m and well as necessary space in the work area.

6.3.2. The distance from the pipe's lower generatrix to the bottom of the pit shall be at least 0.6 m.

6.3.3. During excavations to the depth of 1.5 m and greater the slope steepness shall correspond to the values specified in table 3.

Table 3

Slope steepness

Soil types	Slope steepness (relation of slope height to the base) at the following max depth, m		
	1,5	3	5
Backfilled, non-compacted	1:0,67	1:1	1:1,25
Sand and gravel	1:0,50	1:1	1:1
Sand loam	1:0,25	1:0,67	1:0,85
Clay loam	1:0	1:0,50	1:0,75
Clay	1:0	1:0,25	1:0,50
Loess-like loess	1:0	1:0,50	1:0,50
Notes:			
1. When soils of various types are stripped, the slope steepness is set based on the least stable soil.			

2. Non-compacted backfilled soils include those with the following backfill ages: under 2 years for sandy soils and under 5 years for clay soils.

6.3.4. Trenches and pits may have vertical walls without reinforcement in soils with natural moisture and in absence of groundwater:

- in backfilled, sandy and gravel soils, up to 1 m deep;
- in sandy loams, up to 1.25 m deep;
- in clays and clay loams, up to 1.3 m deep;

Deeper trenches and pits should be dug with slopes or use appropriate reinforcement.

6.3.5. The slope steepness of excavations greater than 5 m in depth and those less than 5 m in depth under hydrological conditions and certain types of soils as well as excavations done in winter, with the onset of thaw period and slopes that were subject to moisture, shall be set in the work execution project/plan.

6.3.6. When it is impossible to create a bias, the sides of the excavation should be strengthened in accordance with the project / project of the work.

6.3.7. Reinforcement shall be installed from the bottom upwards as the excavation not greater than 0.5 m in depth is done.

6.3.8. During installation of reinforcement its upper part shall protrude at least 15 cm up over the edge of an excavation.

6.3.9. Before workforce entry into excavations greater than 1.3 m in depth, the person in charge of safety shall inspect the condition of slopes and the reliability of reinforcement of the sides of the excavation.

6.3.10. Boulders and stones and soil delaminations found on the slopes shall be removed.

6.3.11. Workforce entry into excavations with slopes subject to moisture is allowed after a thorough inspection of slopes and condition of unstable soil in the locations where ‘canopies’ or cracks (delaminations) were found by a person in charge of safety.

6.3.12. With the onset of thaw period the excavations done in winter shall be inspected and measures to ensure stability of slopes and reinforcement shall be taken.

6.3.13. When using a single-bucket excavator to excavate, the working face shall be determined in the WEP so that no “canopies” of soil are formed in the process of work.

6.3.14. Reinforcements in the excavations shall be dismantled from the bottom upwards during backfilling of the excavation, unless otherwise stated in the work execution project/plan.

6.3.15. For descending to and quick egress of workers, the pit/trench should be equipped with step ladders at least 75 cm wide and at least 1.25 of the pit depth long, but not longer than 5 m, one ladder per each pit end (two ladders for pipeline repair works).

6.3.16. When the slope angle is not greater than 60% ramps not less than 75 cm in width with anti-slip elements and guardrails at least 1.1 m high with a solid kickboard at least 15 cm in height can be installed.

6.3.17. Bridges at least 1.6 m in width equipped with guardrails at least 1.1 m high with a solid kickboard at least 15 cm in height allowing passage of persons over excavations shall be provided.

6.3.18. When performing excavation work in a pit/trench greater than 1.3 m in depth, the Work Team Leader shall organize air monitoring in accordance with Instruction No. 104 Arrangement of Air Monitoring at CPC Facilities.

6.3.19. Work should be performed with maximum caution under continuous watch of WTL. All necessary personal protective equipment and a gas tester should be available on site.

6.3.20. To prevent trench/pit flooding and washing out with surface waters, the borrow material should be placed on the high side with construction of water ditches and dykes, where required.

6.3.21. If water is being accumulated in the pit, appropriate measures should be undertaken to protect workers (wall reinforcement and water removal with pumps).

6.3.22. In the pit workers shall be protected against soil collapse and stones rolling down. It is banned to work on a pit slope above other workers if they are not protected against a potential fall of materials.

6.3.23. Work Team Leader should perform daily inspections of the pit, adjacent areas and support systems (if any) to prevent a soil collapse/shift, destruction of support systems, development of harmful fumes or other hazardous situations.

6.3.24. Inspections shall be performed after heavy rains and other phenomena that can lead to escalation of risk for the workers in the pit. If a hazard is identified, the Work Team Leader shall evacuate the workers from the pit until safety measures have been undertaken.

6.3.25. During performance of earthwork it is prohibited:

- to perform works without execution of Permit-to-Work documents in accordance with the requirements of regulatory documents;
- to commence the work without a reliable two-way communication with the OCC dispatcher, PS shift supervisor;
- to perform earthwork in the absence of Work Team Leader;
- workers are forbidden to approach the excavator buck operation zone closer than 5 m.
- to perform works when barriers and safety signs are not available, at night – when light signals and the locations of passage of persons and vehicles are not available;
- for vehicles to drive on the edge of the pit, trench;
- to pull out the moldboard blade of the bulldozer over the edge of the slope;
- for bulldozer tracks to approach the edge of fresh embankment closer than 1 m;
- to use striking tools (crow-bars, hacks, pneumatic tools) if a trench of electric cables, gas pipelines, trunk pipelines is found at the excavated area;
- for people to be present in the pit, trench if longitudinal cracks in the walls appear;

6.4. SAFETY REQUIREMENTS IN EMERGENCIES

6.4.1. In case of emergency or unsafe condition, Work Team Leader should immediately instruct the workers to take appropriate measures preventing an accident and any harmful effect on workers and leave the worksite, if necessary.

6.4.2. In case of emergency situations, circumstances that pose a risk to the safety of workers, it is necessary to stop the work immediately and act in accordance with the Emergency Response Plan for the facility where the works are performed.

6.4.3. The Work Team Leader shall immediately report the emergency situation to the Site Supervisor and Shift Supervisor.

6.4.4. Work Team Leader has no right to resume the work until the emergency is eliminated, a repeated gas testing is done (where required), safe working conditions are confirmed to be present, and the consent of the Site Supervisor to resume the work process is obtained.

7. LIST OF EXHIBITS

The list of exhibits to this procedure is given in Table 4.

Table 4. List of Exhibits

Exhibit	Title
1.	REVISIONS LOG

