DECISION

OF THE GOVERNMENT OF THE REPUBLIC OF ARMENIA

No 984-N of 10 August 2017

ON SETTING THE TECHNICAL REQUIREMENTS AND STANDARDS FOR THE CONSTRUCTION OF MINING WASTE FACILITIES

Based on point 17 of part 2 of Article 15 of the Subsoil Code of the Republic of Armenia, the Government of the Republic of Armenia ***decides to:***

1. Set the technical requirements and standards for the construction of mining waste facilities, in accordance with the Annex.
2. This Decision shall enter into force on the tenth day following the day of its official promulgation.

Prime Minister
of the Republic of Armenia **K. Karapetyan**

11 August 2017

Yerevan

Annex

to Decision of the Government
of the Republic of Armenia
No 984-N of 10 August 2017

THE TECHNICAL REQUIREMENTS AND STANDARDS FOR THE CONSTRUCTION

OF MINING WASTE FACILITIES

I. GENERAL PROVISIONS

1. Under this Annex, the technical requirements and standards for the construction of mining waste facilities (hereinafter referred to as "a facility"), as well as for the constructed facilities subject to modification shall be set.

2. The provisions of this Annex shall apply to newly constructed facilities for accumulations of mining waste, as well as to tailing dumps, area, place, including any dam (hereinafter referred to as "heap platform") or heap leaching platform when modifying the existing facilities.

II. TECHNICAL REQUIREMENTS AND STANDARDS FOR THE CONSTRUCTION OF TAILING DUMPS

3. Tailing dump construction project shall include:

   (1) the location and project requirements necessary for prevention of soil, air, groundwater or surface water pollution in accordance with the requirements of the legislation of the Republic of Armenia, including the geological, hydro-geological, seismic and geo-technical factors;

   (2) the effective measures for collection of polluted (and leached, if available) water;

   (3) the measures aimed at reduction of water or wind erosion to the extent technically possible and economically feasible;

   (4) the measures which must be implemented (in short and long terms) for ensuring the physical stability of the tailing dump during the construction, management and maintenance thereof;

   (5) the measures which must be implemented (in short and long terms) for

preventing the pollution and intoxication of the soil, air, groundwater and surface water;

(6) the measures, implementation whereof will minimise the damage caused to the landscape as much as possible.

4. As per the structural mode, tailing dumps shall be:

(1) dammed (bulk), where interlocking structures are built to their full height, either at once or in sequence;

(2) gradually constructed tailing dumps, where first a not high-rise primary embankment (dam, barrage) is built, then the tailing dump is increased in height by the gradual construction of secondary dams through embankment;

(3) without a dam, by excluding the construction of both dams and primary barriers.

5. Depending on the terrain of the area, the following types of tailing dumps shall be separated according to location:

(1) gully — located in gullies or cloughs interlocked by a barrage;

(2) plain — located in a flat area with an embankment around the entire perimeter;

(3) gully–plain — located in a plain intersected by a gully, where the lowland part is embanked, and the gully is closed by a dam;

(4) valley — located in river-valleys embanked from two or three sides, depending on terrain of the locality;

(5) hillside — located in places where three sides are surrounded by barrages and the fourth side - by a sloping hillside;

(6) fore shaft — located in the pit of abandoned or old mines; in this case it is possible to place the waste without construction of barriers;

(7) located in a concave (concave bottom) — in this case it is possible to place the waste without construction of a barrage or to place the waste in not high-rise barrages constructed.

6. A tailing dump shall be constructed, formed and the mining waste shall be placed therein or the structure shall be modified in accordance with the project of construction and exploitation of the tailing dump. The tailing dump construction project shall be an integral part of the mining project.

7. When constructing tailing dumps, the requirements established by the legislation of the Republic of Armenia regarding the preservation of the environment and the use of natural resources, as well as the construction, must be observed.

8. Taking into account disposition of the entire mining complex, the construction platform of tailing dumps must be placed in abandoned or useless lands not serving their purpose, in swampy areas, in gullies, in lands not suitable for agricultural use, close to the mining and refining plant and away from settlements, reservoirs, and other important infrastructures as much as possible.

9. The platform of a tailing dump shall be selected in places free of flooding, waterlogging, surface runoff, or in places where there is minimal surface flow from the surrounding catchment basin or in places with flow bypassing the tailing dump.

10. Where the waste subject to placement contains useful components that may be used later, no other mining waste must be dumped into the tailing dump. In this case, it is necessary to carry out separate storage thereof, for the purpose whereof a separate additional platform is selected. In cases where temporary storage of such waste is carried out, any ecological risk must be assessed as follows:

(1) it is necessary to minimize the area of the place of temporary placement of

highly hazardous mining waste and the storage period;

(2) temporary mining waste must be placed in areas with the lowest possible permeability;

(3) it is necessary to ensure the removal of the water flow caused by precipitation from the area of placement of temporary mining waste;

(4) collection, cleaning of water flow from the area of placement of temporary mining waste and disposing it into the river network must be ensured.

11. In case of placement of tailing dumps on a base with weak and settling soils, the foundation must be definitely prepared, which will ensure safe and reliable exploitation of dams, barriers and other structures surrounding the tailing dump.

12. On the platforms, where there is a possibility of the passage of mudflows, it is possible — in case of an appropriate justification — to place a tailing dump, where construction of mudguard or mud removal structures is planned.

13. Tailing dumps must be placed in karst base level districts and on platforms composed of permeable soils with high base using antifiltration measures, which will exclude the absorption of polluted tailing dump water and the possible pollution of underground water.

14. Construction of a tailing dump in a landslide area and in the impact zone of landslide shall be prohibited.

15. When selecting the platform for the construction of a tailing dump, it is necessary to predict and evaluate seismological changes (first of all, the frequency and intensity of earthquakes), including the changes in the situation caused by "directed seismicity", the degree of activity of nearby faults that cause earthquakes, as well as that of seismic resistance of the tailing dump.

16. Tailing dumps must be constructed based on each specific condition, taking into

account all (natural and structural) conditions that exclude contamination of the environment (including atmospheric air, soil, water, etc.).

17. When constructing tailing dumps, it is necessary to take into account the possibility of further use of the waste contained therein, the possibility of cooling the tailing dump and further use of the area, and the safety of its existence for the affected settlements after filling, conservation and reclamation.

18. The surroundings of tailing dumps must have a mechanical protection zone that will ensure the safety of people, animals, buildings and structures.

19. The mechanical protection zone must be equipped with signs prohibiting the entry of outsiders, the distance between which must be not more than 100 meters.

20. Mechanical protection zones, each 20 meters wide, must be located on both sides of the paths of the clarified water aqueducts and highway sludge lines, where development and use for other purposes shall be prohibited.

21. Tailing dumps, which are a source of dusting and emission of unpleasant odours, must be separated by a sanitary protection zone from residential, public, medical buildings and constructions and those of healthcare significance, as well as mass recreation places.

22. The sanitary protection zone must be improved and landscaped. It is necessary to carry out land improvement works in that area, that is, filling of pits, trenches and gullies, levelling of the area, preservation of green sprigs.

23. The selection of the types of tailing dumps barriers (dam and barrage) shall depend on the availability of construction soil types in the adjacent areas, the construction method, the engineering geological and hydrological conditions of the base of the dam or barrage, and the productivity of the mining and refining plant.

24. When justifying the slope stability of interblocking barrages, special attention must be paid to the intensity of soil and waste washing, as well as the seismic

resistance of the locality.

25. Both the soils used for the construction of water retaining dams and barrages, as well as the waste from the mining and refining plant may be used for the construction of barriers interblocking tailing dumps.

26. Tailing dumps may be filled in two ways: from the dam or barrage to the banks and from the banks to the dam or barrage.

27. The waste shall be hydraulicked to dams and barrages in three ways: trestle, zenith and non-trestle.

28. Clarified waters shall be removed from the heaps through the wells, spillways and sludge tanks placed inside the ponds, as well as by pumping out the clarified water for reuse purposes.

29. The organisation operating the tailing dump must develop a technical safety certificate of the tailing dump and submit it to the Ministry of Emergency Situations of the Republic of Armenia for technical safety examination.

30. The organisation operating the tailing dump must develop a plan for dealing with emergency situations arising from tailing dump accidents.

III. THE TECHNICAL REQUIREMENTS AND STANDARDS FOR THE CONSTRUCTION OF A HEAP PLATFORM

31. A heap platform shall be constructed, formed and the mining waste shall be placed in accordance with the mining project and the heap construction project.

32. The heap platform construction project shall be drawn up on the basis of the data obtained as a result of complex engineering-geological, hydrogeological, geotechnical, geophysical researches and seismic microzoning works carried out in advance on the heap platform.

33. The heap platform shall be divided into three groups as per the disposition:

    (1) external — placed outside the boundaries of the open pit;

    (2) internal — placed in the developed areas of the open pit;

    (3) combined.

34. It is necessary to select the heaps placement platform, first of all, in the developed areas of the open pit (internal heap), outside the open pit (external heap) or both together, combined.

35. Depending on the methods of mechanization of works, generation of a heap may be:

    (1) Bulldozer;

    (2) Excavator;

    (3) Conveyor;

    (4) Hydraulic.

36. Prior to construction, the fertile lands of the heap platform area, if any, must be overburdened and stored in a separate place so that it may be used for final reclamation.

37. Natural slopes, gullies, holiows, cloughs and lands not suitable for agricultural use must be used for placement of external heaps.

38. The methods of formation of heaps and the sequence and order of heaping must create possibility of favourable conditions for further use and reclamation of the locality.

39. For ensuring the possibility of further complex use of non-conditioned ore and overburden roaches, selective storage must be envisaged based on the lithological composition of mining waste and the technological features of its generation.

40. The volume of the heap capacity must be determined for the total volume of mining waste removed from the mine.

41. Values of characteristics of heaps (the heights of individual highwalls, the number of stacks, the width of bankettes between the stacks, etc.) must be calculated at the design stage.

42. When placing heaps on steep slopes, for preventing the heap from creeping or sliding, it is necessary to provide measures to prevent these phenomena.

43. Measures must be envisaged for preventing the flooding of heaps and the ingress of surface and open pit waters into them.

44. For preventing the ingress of surface waters in hazardous waste heaps, it is necessary to build pit props, scours collecting and removing the waters, derivation canals, so that it is possible to collect these waters and, bypassing the heaps, reduce the possible contact of water with hazardous waste.

45. Any leakage of waters polluted from hazardous heaps must be prevented, for which it is necessary to collect these waters, build a sewage treatment system and then neutralise these waters and release them into the river network.

46. For preventing the pollution of underground waters, it is necessary to implement anti-filtration measures on the platforms of hazardous waste heaps by covering them with water-repellent and impermeable materials or soils.

47. Heaps that are a source of dusting must be separated by a protective zone and anti-dusting measures must be applied. In hot and dry weather, it is necessary to conduct dust allaying by intensively watering dust generation foci.

IV. THE TECHNICAL REQUIREMENTS AND STANDARDS FOR THE CONSTRUCTION OF A HEAP LEACHING PLATFORM

48. A heap leaching platform is a structure on which a process is carried out, which includes layering of crushed ore for the purpose of extracting precious metals and individual leaching of each layer.

49. The safety and stability of the platform shall be the primary conditions for the construction of a heap leaching platform. When constructing a heap leaching platform, it is necessary to take into account the following:

(1) selection of platform location and project requirements necessary for prevention of soil, air, underground or surface water pollution in accordance with the requirements of the legislation of the Republic of Armenia, including the geological, hydro-geological, engineering-geological, seismic and geo-technical factors;

(2) effective measures for collecting water leaking from the ore heap on the leaching platform and returning it to the circulation system;

(3) the measures aimed at reduction of water or wind erosion to the extent technically possible and economically feasible;

(4) the measures which must be taken (in short and long terms) for ensuring the physical stability of the heap leaching platform during the construction, management and maintenance thereof;

(5) the measures which must be taken (in short and long terms) for preventing the pollution and intoxication of the soil, air, groundwater and surface water;

50. When selecting a heap leaching platform, the disposition of the entire mining complex must be taken into account, it must be located on lands not suitable for agricultural use, close, as much as possible, to the ore crushing and grinding plant and away from settlements, surface and groundwater resources, and other important infrastructures.

51. The heap leaching platform shall be selected in places free of flooding, waterlogging, surface runoff, or in places where there is minimal surface flow from the surrounding catchment basin or in places with flow bypassing the heap leaching platform.

52. The base of a heap leaching platform must be clad (coated or covered) with impermeable soils or materials (membranes) that will exclude leaks to the environment.

53. The material and type of clad covering the base of the platform must be selected in such a way that it is possible to maintain the content of the ore clamps in the intended values.

54. Clad materials of the base of a heap leaching platform must have the following properties:

(1) must be stable against the corrosive and aggressive effects of chemically active toxic substances;

(2) must be as durable as possible;

(3) must completely exclude absorption or penetration (diffusion) of chemical solutions (cyanides) into the environment (soil, underground water).

55. Layering of crushed ore on the leaching platform and the individual leaching of each layer for the purpose of extracting precious metals, the release of the

depleted leaching solution (diluted sodium cyanide) on the surface of the ore heap through drippers or showers, as well as the duration of the leaching cycle of the ore heap shall be determined on the basis of the heap leaching project.

56. Calculations of stability of the slopes of a heap leaching platform must be carried out based on the conditions of the principles of stable and seismic loading.

57. Calculation of stability must include:

    (1) assessment of geometrical features of the heap leaching platform and ore heap for the purpose of determining the most critical (non-stable) two-dimensional sections of the node;

    (2) determination of material properties and geotechnical conditions of soils based on existing data of the mining project and subsoil district;

    (3) calculation of minimum safety indices for different analytical versions of slope collapse.

58. Based on the principle of saving water resources, in practice, the leaching process and the implementation thereof must be entirely based on closed circulating water systems.

59. Water flowing out of the heap leaching platform must be collected and cleaned, for which it is necessary to build water storage and cleaning basins.

60. Sizes of storage basins must be determined according to design criteria using calculated data of water balance of the heap leaching platform.

61. It is necessary to provide that water flows of cleaning solutions and storm water (snow melt water) in the area of the heap leaching platform are accumulated by gravity at the lowest point of the heap leaching platform, and then flow to the cleaning basin through a sludge tank.

62. During the depletion of the resource and closing of the heap leaching platform, the heap must be washed until the (practical) depletion of precious metals

therein, and the final solutions must be neutralised, cleaned and accumulated in the rainwater collection basin.

63. For the purpose of safe organisation of implementation of the heap leaching process, it is necessary to provide sanitary measures, including a reagent and sorbent materials management programme, since during the decomposition of sodium cyanide and the sorption of gold from cyanide solutions, there is a risk of emission of toxic cyanic acid into the atmosphere of production areas.

64. For reducing the decomposition of sodium cyanide and the emission of cyanic acid from the solution into the atmosphere of the premises, it is necessary to provide for adding (filling-in) sodium hydroxide in the tanks (containers) of the dense (10 percent) solution of sodium cyanide to keep the pH above 12.

65. For conducting the gold sorption process more safely, in case the pH of the solutions is reduced below 10, it is necessary to provide for adding sodium hydroxide in them up to the specified value.

66. Aspiration of released cyanic acid must be provided in solvent tanks and sorption columns, according to the volume of processed solutions and the concentration of sodium cyanide therein.

67. It is necessary to keep the pH of solutions at the level of 10-11 to exclude the generation of more toxic hydrogen cyanide. For excluding the emission of hydrocyanic acid salts (in the form of aerosol) and hydrogen cyanide (in the form of gas or steam) into the atmosphere, it is necessary to place all the equipment as close as possible, to keep them under a certain negative pressure.

68. Ventilation must be in reserve. The air removed by pulling ventilation systems must be cleaned of toxic substances before it is released into the atmosphere, up to a content not exceeding the permissible limit density.

69. Decontamination of solutions, which includes natural, i.e. atmospheric, and chemical degradation of cyanides, must be carried out after the exploitation of leaching heaps.

70. The heap leaching platform must be fenced around its perimeter or a guarded safety zone must be established. The purpose of the fence and the safety zone is ensuring the prevention of the entry of unauthorised persons, as well as animals into the area of the heap leaching platform.

Chief of Staff of the Government
of the Republic of Armenia **V. Stepanyan**