ICS 13.020
CCS Z 06

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 43936-2024

Technical specification for land reclamation and ecological restoration of petroleum and natural gas projects

石油天然气项目土地复垦与生态修复技术规范

Issued on: April 25, 2024 **Implemented on: August 1, 2024**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

3 Terms and definitions

3.1 The central term is printed with the Chinese heading for land reclamation and ecological restoration of oil and gas projects and the English term mine land reclamation and ecological restoration. It is defined as the activity of taking preventive and restorative measures, relying on artificial support and guidance and on natural recovery capacity, against the damage to the geological environment, the damage to land and the damage or degradation of the ecosystem caused by the extraction of oil and gas resources, so that the geological environment of the production and construction area becomes safe and stable, the damaged land is reclaimed and used and the functions of the ecosystem are restored

or improved. A note gives the abbreviated Chinese form, rendered here as reclamation and restoration.

3.2 natural restoration: stopping human disturbance of the ecosystem so as to lighten the load and pressure on it and relying on its self-regulating and self-organising capacity to let it succeed, renew and recover naturally in an ordered direction. The source is given as TD/T 1070.1-2022, 3.2.

3.3 landscape construction: adjusting and optimising the structure and allocation of land resources, water resources, biological resources and the human settlement environment from the scale of watershed hydrology and landforms, following the integrated protection and restoration of mountains, waters, forests, farmland, lakes, grassland and sand, and taking full account of the point, line, surface and network landscape integration of the oil and gas project area, so as to build an ecosystem in harmony with the surrounding landscape.

3.4 to 3.6 well field: the working site for drilling, exploration and extraction of oil and gas, divided by the nature of the land use into temporary land and construction land; road: the roads built for exploration, extraction, processing, transport and patrolling of oil and gas; pipeline: the pipes used to convey oil, gas and water and connecting pumps, valves or control systems, including buried cable and electric line ducts serving the production and construction of the project. All three cite TD/T 1031.5-2011, modified.

4 Overall requirements and basic principles

4.1 The work shall follow the concept of integrated protection and restoration of mountains, waters, forests, farmland, lakes, grassland and sand, and keep to the policy of conservation first, protection first and natural recovery as the main approach. Through mitigation and protection, prevention and control and reclamation and restoration measures, reclamation and restoration and mineral resource extraction are to be planned together and implemented in a coordinated way, damaged land is to be reclaimed and used in good time, and the diversity, stability and sustainability of the ecosystem of the project area are to be restored and raised, promoting green mine construction and the harmonious coexistence of people and nature.

4.2.1 Protection first and control at source. Following the principle of protection during development and development during protection, production and construction processes are to be optimised and reasonable prevention and control measures adopted so as to reduce the damage to the geological environment, to land and to vegetation caused by resource extraction; where damage to land and vegetation cannot be avoided, reclamation and restoration are to begin in good time once the geological safety hazards have been removed.

4.2.2 Unified planning and coordinated implementation. Reclamation and restoration work

is planned as a whole, resource extraction and the planning and construction of reclamation and restoration are carried out at the same time so that reclamation and restoration proceed alongside extraction over the whole life cycle, and reclamation and restoration advance together with green mine construction, protection, prevention and control and reclamation measures being taken at the same time.

4.2.3 Combination of artificial guidance and natural recovery. Following the principle of using land for cultivation, forest, grassland, wetland, wasteland or sand as suits it, damaged land is brought to a usable state and ecosystem functions are restored by engineering, biological and chemical means; the direction and process objectives of artificial guidance are to be clear, the early artificial support reasonable, and nature is to be respected and used so that damaged land and ecosystems return to a virtuous circle as soon as possible.

4.2.4 Landscape harmony and functional improvement. Given that oil and gas projects have many scattered points, cover a wide area and use small individual parcels, the direction, measures and standards of reclamation and restoration are determined, on the basis of alignment with territorial spatial planning and mineral resources planning, in accordance with the original land use type or the same land use type in the surroundings; the restored ecosystem is to be in harmony with the surrounding ecosystem, biodiversity protection is implemented over the whole life cycle and the recovery gap is to be narrowed as far as possible.

4.2.5 Public participation and monitoring throughout. Contact with interested parties is to be maintained throughout the life cycle of development, use, protection and restoration, giving all of them meaningful opportunities to take part so as to ensure the fairness and inclusiveness of the project; local traditions, customs and social expectations are to be respected; and monitoring throughout is to be carried out, evaluating and analysing the ecological problems arising during resource development and the effects of reclamation and restoration, the plan being revised or adjusted according to the monitoring and evaluation results.

6 Basic investigation and problem identification and diagnosis

6.1.1 The investigation covers natural conditions (geographical position, climate, hydrology, topography and landforms, regional geology, soil and vegetation, surveyed over the project area and its surroundings); socio-economic and cultural conditions (the agricultural population, cultivated land per head, net income per head and agricultural production of the last three years, and cultural resources such as historic monuments, religious sites, protected historical and cultural areas, geological heritage reserves and scenic areas); production and construction conditions (extraction history and present state, extraction range, extraction method, production process, production scale, service life or remaining life and extraction plan); the present state of the geological environment, surveyed by land unit such as well field, road and pipeline and their surrounding area of influence, making clear

the type, distribution, scale and features of the problems; land use, making clear the position, area, degree and type of the land already damaged and, for areas already reclaimed, the measures, effects and investment involved; and ecological conditions, covering protected areas, world natural heritage, ecological conservation red lines, protected species, ancient and famous trees, vegetation cover and biodiversity, and the types, numbers and distribution of animal populations. Where a project crosses several landform regions or districts, the basic investigation is carried out separately for each; where blowouts, leaks or other events have had a major effect on the ecosystem, a detailed special investigation is to be carried out.

6.1.2 Investigation methods are chosen according to the content and include field survey, remote sensing survey, geophysical prospecting, drilling, enquiry and the collection of documents. The procedures and methods for surveying the present state of the geological environment follow GB 50021, GB/T 40112, HJ 25.1, DZ/T 0221, DZ/T 0287 and HJ/T 166; natural conditions, present land use and the present state of land damage and reclamation follow TD/T 1010, TD/T 1055-2019 and TD/T 1049; ecological conditions follow LY/T 1814, TD/T 1070.1 and TD/T 1070.7. Laboratory testing of organic pollutants, heavy metals and soil physical and chemical properties is carried out according to GB 15618, GB 36600 and HJ/T 166, and test reports issued by qualified testing bodies are to be provided.

6.2 On the basis of the results of the basic investigation, the present state of damage to the geological environment, of land damage and of ecological damage is analysed. The production and construction processes that may damage land are described and the type, range, area and degree of the land to be damaged are predicted for well fields, roads and pipelines according to TD/T 1031.5, stating the method and the basis of the prediction. Taking account of the susceptibility of the region to geological hazards, the analysis and prediction of damage to the geological environment and to the soil and water environment are outlined according to DZ/T 0223, with particular attention to the organic pollutants and the changes in the temperature field that extraction, storage and transport may cause, and with a brief analysis and prediction of damage to vegetation and to ecological functions. Finally, by comparison with a reference ecosystem, the ecological problems arising during exploration, development and construction, operation and decommissioning are diagnosed and their severity is graded according to TD/T 1070.1.

9 Project implementation

9.1 Protection, prevention and control and reclamation and restoration measures are to be proposed for the damage to the geological environment, to land and to the ecosystem throughout construction, production and reclamation. The reclamation and restoration standard is to match the original land use type or the same land use type in the surroundings, and new roads, irrigation and drainage and other supporting facilities are to connect with the surroundings. Reclamation follows the principle of reclaiming while