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**ENERGY SECTOR STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA
中华人民共和国能源行业标准**

NB/T 10338-2019

P

Replace DL/T 5376-2007

**Code for Defining Land Requisition Treatment Scope
of Hydropower Projects**

水电工程建设征地处理范围界定规范

(征求意见稿)

Issued on December 30, 2019

Implemented on July 1, 2020

Issued by National Energy Administration of the People's Republic of China

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Chief Development Department: China Renewable Energy Engineering Institute

Approval Department: National Energy Administration of the People's Republic of China

Implementation Date: July 1, 2020

China Water & Power Press

中国水利水电出版社

Beijing 202x

Introduction

This English version is one of China's energy sector standard series in English. Its translation was organized by China Renewable Energy Engineering Institute authorized by National Energy Administration of the People's Republic of China in compliance with relevant procedures and stipulations. This English version was issued by National Energy Administration of the People's Republic of China in the Announcement [202x] No.x dated xxxx,xx 202x.

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Many thanks go to the staff from the relevant standard development organizations and those who have provided generous assistance in the translation and review process.

For further improvement of the English version, all comments and suggestions are welcome and should be addressed to:

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本译本为国家能源局委托水电水利规划设计总院按照有关程序和规定,统一组织翻译的能源行业标准英文版系列译本之一。202x年xx月xx日,国家能源局以202x年第x号公告予以公布。

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Announcement of National Energy Administration of the People's Republic of China [2019] No. 8

National Energy Administration approved 152 energy industry standards (Annex 1) and 39 English versions of energy industry standards (Annex 2) such as “Code for Safe and Civilized Construction of Onshore Wind Power Projects” .

Attachment:

1. Industry standard catalogue
2. English version of industry standards

National Energy Administration of the People's Republic of China

December 30, 2019

Attachment:

Directory of Sector Standards

Serial number	Standard No.	Title	Replaced standard No.	Adopted international standard No.	Approval date	Implementation date
...						
13	NB/T 10338-20 19	Code for Defining Land Requisition Treatment Scope of Hydropower Projects	DL/T 5376-2007		2019-12-30	2020-07-01
...						

Foreword

According to the requirements of Document GNKJ [2015] No.283 issued by National Development and Reform Commission Office of the People's Republic of China, "Notice on Releasing the Sector Standards Plan of energy aera in 2015", after extensive investigation and research, with due consideration of the resettlement practice for hydroelectric projects and wide solicitation of opinions, the drafting group has revised this specification.

The contents of this specification include: reservoir-inundated area and impoundment-affected area; project construction area; boundary of land requisition and resettlement; boundary pillar arrangement design; requirements and outcomes of staged works.

The contents of this specification which has revised include:

——Adding the contents of disposing of standby quarry.

——Adding the contents of technical requirement of adding object and defining scope during operation and maintenance stage of hydropower station.

——Deleting the contents about the area affected by impoundment under observing.

——Deleting the contents of geological determination method about impoundment-affected area of reservoir bank landslide, reservoir bank collapse and reservoir immersion.

——Improving the contents of design flood calculation, impoundment-affected area and project construction area.

——Improving the contents of technical requirement of boundary of land requisition and resettlement.

——Improving the contents of requirements and outcomes of staged works.

This code is administrated by National Energy Administration of the People's Republic of China, is proposed and administrated daily by China Renewable Energy Engineering Institute, is explained by Energy Sector Standardization Technical Committee on Hydropower Planning, Resettlement and Environmental Protection. Comments and suggestions in the implementation of this code should be addressed to:

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1 General Provisions

1.0.1 This code is formulated with a view to standardizing the defining land requisition treatment scope of hydropower projects.

1.0.2 This code is applicable to the defining land requisition treatment scope of hydropower projects.

1.0.3 The land requisition treatment scope of hydropower projects shall include reservoir-inundated area and impoundment-affected area, project construction area. The land scope of resettlement projects shall implement the provisions of national and provincial people's governments and relevant industry standards.

1.0.4 The mission of defining land requisition treatment scope of hydropower projects shall define flood standard of submerged object, analysis and define the scope of reservoir-inundated area and impoundment-affected area, project construction area, draw the boundary of land requisition and resettlement, design boundary pillar arrangement.

1.0.5 The land requisition treatment scope of hydropower projects shall follow these principles:

- 1 Land shall be planned according to construction and operation management, improving land use efficiency, defining land requisition treatment scope reasonably.
- 2 The impact of project construction and operation management on surrounding areas should be reduced, avoiding areas which exist geological hazards, using land safely.
- 3 Saving land and occupying less cultivated land.

1.0.6 Defining land requisition treatment scope of hydropower projects shall comply with "Specifications of resettlement planning and designing for hydroelectric project" (DL/T 5064-2007).

1.0.7 In addition to this code, defining land requisition treatment scope of hydropower projects shall also comply with the current relevant standards of China.

2 Reservoir-Inundated Area and Impoundment-Affected Area

2.1 General Requirements

2.1.1 Reservoir-inundated area and impoundment-affected area shall include Reservoir-inundated area, impoundment-affected area

2.1.2 Reservoir-inundated area shall include the area below the normal reservoir water level, and the area, which is submerged temporarily caused by reservoir flood, wind wave, ship wave and ice jam.

2.1.3 Impoundment-affected area shall include the area of reservoir bank landslide, reservoir bank collapse, reservoir immersion, reservoir bank deformation, reservoir karst waterlogging, reservoir leakage caused by impoundment, and the area of water-reduced river reach, and the area around reservoir which is short of basic production and living conditions, and isolated island.

2.2 Reservoir-Inundated Area

2.2.1 Reservoir-inundated area under the normal water level of reservoir shall start from the axis of dam, and extend to the site where the perennial average flow level of natural channel reach the normal water level.

2.2.2 Flood standard shall be determined depending on different submerged objects in backwater area. The backwater surface line shall be calculated in different periods, and the thinning-out section of reservoir backwater shall be confirmed rationally.

2.2.3 The confirmation of flood standard of submerged objects shall comply with the following requirements:

- 1 Flood standard of submerged object shall be determined by its importance, degree of resistance to flood and original flood control standard, as well as reservoir regulating performance and operation mode, taking safety and economy into consideration
- 2 Flood standard of submerged objects such as railways, highways, electricity facilities, telecommunication facilities, water resources and hydropower facilities, cultural and historic relics, shall comply with the "Standard for flood control" (GB 50201-2014) and Other relevant industry standards. Flood standard may be determined by the importance of submerged objects if there is no such specification in those standards.
- 3 Flood standard of submerged objects shall comply with the upper limit of design flood

recurrence interval showed in Table 2.2.3, or it shall be analyzed and demonstrated.

Table 2.2.3 Flood standard of different submerged objects

submerged objects	Flood frequency (%)	flood recurrence interval (years)
cultivated land, garden plot	50~20	2~5
forest land, grassland, unutilized land	normal pool level	—
rural residential area, town, general city, general industrial and mining area	10~5	10~20
medium-sized city, medium-sized industrial and mining area	5~2	20~50
important city, important industrial and mining area	2~1	50~100

2.2.4 The design flood backwater surface line shall be calculated complying with the "《Code for calculation of reservoir backwater of hydropower projects》(NB/T 35093)", and meeting the following requirements:

- 1 The backwater surface line in flood season and non-flood season shall be calculated depending on reservoir operation mode.
- 2 The backwater surface line of reservoir impounded by stages shall be calculated respectively. It shall calculate backwater surface line during construction period of the project whose construction duration is long, and flood level is changed greatly from natural level.
3. If there are tributaries feeding into reservoir or important submerged objects in its tributaries, the backwater surface line of reservoir shall be calculated respectively according to the following two situations: when reservoir inundation standard flood occurs in tributary, the same frequency flood occurs in main stream, and when reservoir inundation standard flood occurs in main stream, the tributary flood discharge is equal to the flow difference between upstream and downstream of the main stream, and the backwater surface line shall be specified as the envelop of those two situations. The backwater surface line shall be specified as the outer envelop of tow combinations .
- 4 Sediment deposition shall be taken into consideration while backwater is calculated. Sediment deposit life shall be specified from 10 years to 30 years, depending on sediment character, reservoir operation mode and importance of submerged objects.

- 5 The backwater section shall be consistent with the section of sediment scouring and deposition calculating. It shall set more sections in river reach or thinning-out section if there is important submerged object.
- 6 The designed flood backwater surface line shall be specified as the outer envelop of flood backwater surface line calculated in different stages of the same frequency flood.
- 7 The backwater surface line should be calculated by Linear Regression if there is great difference in elevation in backwater between two adjacent sections.

2.2.5 The thinning-out section of reservoir design flood backwater and the end of submerged area shall be specified meeting the following requirements:

- 1 The section shall be defined as the thinning-out section where elevation between design flood backwater surface line and natural water surface line of the same frequency flood is 0.3 m.
- 2 The end of submerged area is the point where the elevation of perennial average flow surface line of natural channel is the same with the elevation of thinning-out section.
- 3 If the design flood surface line of cultivated land and garden plot is higher than the design flood surface line of residential migration in the upstream of the end of submerged area, the residential migration area and the end of submerged area shall be specified by design flood surface line of cultivated land and garden plot.

2.2.6 The water level rising caused by wind and wave should be calculated taking wind speed and fetch into consideration. The water level rising caused by wind and wave may be calculated by the following empirical equation, when bank slope is below 45°, fetch of wave is within 30km, and wind speed is within force 7.

$$h_p = 3.2Kht \tan \alpha \quad (2.2.6-1)$$

$$h = 0.0208V^{5/4}D^{1/3} \quad (2.2.6-2)$$

where

h_p is the water level rising caused by wind and wave(m);

K is coefficient related to roughness of bank slope, K may be 0.77~1.00 if it is smooth and even artificial slope, such as block stone or concrete slab slope, K may be 0.5~0.7 if raised path through fields is below 0.5m;

- a is bank slope($^{\circ}$);
- h is height of wave in front of bank(m);
- V is speed of wind perpendicular to bank(m/s);
- D is fetch of wave in bank windward side(km).

2.2.7 The water level rising caused by wind and wave shall be calculated meeting waterborne transportation industry requirements, if there is a demand for navigation.

2.2.8 The submerged area of ice jam backwater shall be specified by the reservoir average water level, average reservoir inflow discharge and inflow discharge of ice while ice appear a lot, together with the backwater surface line calculated during freeze-up period and ice break-up period.

2.2.9 Reservoir safety elevation shall be specified meeting the following requirements:

- 1 The scope of reservoir safety elevation shall be specified by wind, wave, and ship wave etc, taking safety into consideration. And the submerged impact of cultivated land and residential area may be analyzed.
- 2 Reservoir freeboard may be specified depending on the importance of different submerged objects.
- 3 The water level rising caused by wind wave and ship wave shall be calculated next to the dam where the backwater has no significant effect. If calculated reservoir freeboard of cultivated land is less than 0.5m, it shall be 0.5m. If calculated reservoir freeboard of residential area is less than 1.0m, it shall be 1.0m.

2.2.10 Inundated area of staged impounded reservoir shall be specified by the backwater surface line, which shall be calculated on the basis of construction and impoundment plan and the flood standard of submerged objects, taking water retaining condition of cofferdam and the staged-impounded water level in consideration. Inundated area of cofferdam closure beyond reservoir-inundated area shall not be in the scope of land requisition treatment.

2.2.11 The land raised above the water level by engineering measure to regain its original use in reservoir inundated area shall be specified as temporary-used land.

2.2.12 Reservoir inundated area shall consist of the area below the normal pool level, and the area specified by the outer envelop of temporary submerged area caused by reservoir flood backwater, and

water level raised by wind wave, ship wave and ice jam backwater.

2.3 Impoundment-Affected Area

2.3.1 The area of reservoir bank landslide, reservoir bank collapse, reservoir immersion, reservoir bank deformation, reservoir karst waterlogging, reservoir leakage caused by impoundment, shall be specified according to the importance of subjects and the extent of damages based on results of Special Geological Report on Impoundment-Affected Area for hydropower project.

2.3.2 The area of reservoir bank landslide and reservoir bank deformation, where exists residential area or significant constructions or facilities, and the extent of damages from Special Geological Report on Impoundment-Affected Area for hydropower project is high shall be identified as processed area of the corresponding object.

2.3.3 The area of reservoir bank collapse where exists residential area, cultivated land, garden plot, significant constructions or facilities, and the extent of damages from Special Geological Report on Impoundment-Affected Area for hydropower project is high shall be identified as processed area of the corresponding object.

2.3.4 The area of reservoir bank deformation, reservoir karst waterlogging and reservoir leakage, where exists residential area, cultivated land, garden plot, significant constructions or facilities, and the extent of damages from Special Geological Report on Impoundment-Affected Area for hydropower project is high shall be identified as processed area of the corresponding object.

2.3.5 The water-reducing river reach, the area around reservoir which is short of basic production and living conditions, and isolated island shall be comprehensively analyzed according to the cause of the impact and the loss of the affected object to determine the processed area. It shall be specified as processed area while it meets one of the following conditions:

- 1 The area of water-reducing river reach caused by water diversion of the hydropower project where it is difficult to divert water for production and living or using shipping facilities, shall be specified as processed area.
- 2 The area around reservoir where is short of basic production and living conditions together with isolated island caused by impoundment shall be specified as processed area.

2.3.6 The area affected by staged impoundment should be specified in accordance with the

requirements of Article 2.3.1~2.3.5.

3 Project Construction Area

3.0.1 Project construction area shall mainly include quarry and borrow areas, spoil areas, on-site access area, construction facilities area, camp and project management area. According to the attributes of land use, it shall be divided into temporary land for construction and permanent occupation land.

3.0.2 The analysis and determination of project construction area shall be based on the construction general layout, the land use attributes, and the conditions of land availability, combining with the resettlement needs.

3.0.3 Hydraulic power structure, external connection roads, temporary roads that shall be used permanently to the dam, to the powerhouse, between dams and powerhouses, in the camps and project areas, on-site operation management camps, ecological protection project management areas and other areas to be used permanently shall be classified as permanent land. Quarry and borrow areas, spoil areas, construction facilities area, main temporary roads¹, camps used in construction period, contractor's camps and other areas to be used temporarily shall be classified as temporary area. The standby borrow area should not be included in construction area.

3.0.4 The area where project construction area and reservoir-inundated area overlapped may be classified as reservoir-inundated area, and according to the sequence of land use, which may be requisitioned in advance, as project construction area.

¹ temporary roads are those roads to spoil areas, to material areas, to the dam, for concrete transport, and to connect the areas such as construction production facilities and contractor camps.

4 The Boundary of Land Requisition and Resettlement

4.0.1 The boundary of land requisition and resettlement should include the boundary of resident relocation and boundary of land requisition, and should be delineated according to the analysis of the determined reservoir-inundated area, impoundment-affected area and project construction area.

4.0.2 The boundary of resident relocation should be determined according to the requirements of buildings demolition is located Reservoir-inundated area, impoundment-affected area and project construction area.

4.0.3 According to the land use attributes, the boundary of land requisition should be divided into boundary of land requisition, boundary of temporary land occupation, and boundary of land processing², and should meet the following requirements:

- 1 The boundary of land requisition should mainly include the land in Reservoir-inundated area, and the land in the permanent area of project construction area.
- 2 The boundary of temporary land occupation should mainly include the protected area elevated in Reservoir-inundated area, and the permanent area in project construction area.
- 3 The boundary of land processing should include the areas which are outside of the land requisition boundary and the temporary land occupation boundary that need to be processed.

² land processing totally means land requisition or land occupation, and other processing methods to land.

5 The Design of Boundary Piles Layout

5.0.1 The resident relocation boundary and land requisition boundary should be marked on site with boundary piles, and boundary piles may be divided into temporary boundary piles and permanent boundary piles.

5.0.2 The temporary boundary piles and signs should be set out in site according to actual need of inventory survey by measuring. Those shall be marked by wood piles, or signed on tree trunks, rocks, walls, etc.

5.0.3 The permanent boundary piles may be divided into main boundary piles and dense boundary piles, and shall be divided into reinforced concrete boundary piles, carved boundary piles, steel pipe boundary piles and pool elevation signs according to the material. The production of permanent boundary piles should meet the following requirements:

- 1 The shape of reinforced concrete boundary pile should be rhombus-shaped. The sizes of the main boundary pile should be 10cm×10cm at the top, 20cm×20cm at the bottom, and the height should range from 100cm to 140cm. The sizes of the dense boundary pile should be 5cm×5cm at the top, 10cm×10cm at the bottom, and the height should range from 50cm to 70cm.
- 2 The carved boundary pile should be engraved on the immovable rock, and the size of the groove should be 40cm×8cm.
- 3 The steel pipe boundary pile is made of concrete and steel pipe. The size should be 10cm×10cm at the top, and the height should range from 100cm to 140cm.
- 4 The size of the pool elevation sign should be 5m×3m or 3m×2m.

5.0.4 The layout of permanent boundary piles should meet the following requirements:

- 1 The main points of the boundary of land requisition and resettlement should be set with main boundary piles, which should be control boundary piles.
- 2 The distance between main boundary piles should range from 500m to 1000m, and it should range from 50m to 200m between dense boundary piles. The adjacent piles should be visible from each other. Boundary piles should be set at each turning point.
- 3 The permanent boundary piles should be buried by concrete pouring or tamping with plain

soil. The permanent main pile should range from 15cm to 25cm above the ground, and the dense pile should range from 10cm to 15cm above the ground. The allowable error of the set elevation of the permanent main pile should be less than 10cm, and it should be less than 30cm for the dense pile.

- 4 The permanent boundary piles should adopt reinforced concrete boundary piles, carved boundary piles, and steel pipe boundary piles. Water level signs should be added nearby the areas such as cities, towns and important special items.

5.0.5 The number of boundary piles and signs should be marked according to the following requirements:

- 1 Temporary boundary piles and signs may be numbered by random numbers.
- 2 The numbers of reinforced concrete boundary piles and steel pipe boundary piles should be marked on the top of the piles with concave characters. A number and a horizontal line indicating the elevation should be marked in the carved boundary piles. The numbers of reinforced concrete boundary piles, steel pipe boundary piles and carved boundary piles should be unified. Horizontal line indicating the elevation and text should be marked obviously in water level signs.
- 3 The main piles and dense piles of the permanent boundary piles should be respectively numbered with pinyin and numbers according to the boundary, treatment, effected object, bank and river where the pile is located.

5.0.6 Boundary pile measurement should comply with the technical requirements of current industry standards-"specification for construction survey of hydropower projects" NB/T 35029.

6 Work Requirements and Results at Each Stage

6.0.1 The scope of Reservoir-inundated area, impoundment-affected area and project construction area shall be initially analysed at the stage of preliminary feasibility study. Based on the preliminary normal pool level and standards of design flood control for different objects, backwater may be calculated, and then the scope of Reservoir-inundated area may be determined by backwater and safety elevation of reservoir area near the dam. The scope of project construction area should be determined by the preliminary general construction layout. The confirmation for Reservoir-inundated area and impoundment-affected area of staged impounded may not be ignored. The schematic diagram of Reservoir-inundated area, impoundment-affected area and project construction area should be drawn at the stage of preliminary feasibility study.

6.0.2 The scope of land requisition treatment should be determined in the outline of resettlement planning and the report of resettlement planning at the stage of feasibility study. The main works and results should meet the following requirements:

- 1 The scope of Reservoir-inundated area, impoundment-affected area and project construction area shall be analyzed and determined based on specialized report of normal pool level analysis, specialized report of geological analysis for impoundment-affected area, and specialized report of general construction layout.
- 2 A chapter to analyse the scope of land requisition treatment should be draw up.
- 3 The schematic diagram of Reservoir-inundated area, impoundment-affected area and project construction area should be drawn.
- 4 The diagram of boundary of Reservoir-inundated area should be drawn, and the lines of the resettlement boundary and land requisition boundary at each acceptance stage should be marked, and the backwater and the processing elevation of the Reservoir-inundated area should be proposed. The diagram of boundary of impoundment-affected area should be drawn, and the lines of the resettlement boundary and land requisition boundary should be marked, and the inflection point coordinates should be proposed. The diagram of boundary of project construction area should be drawn, and the lines of temporary area and permanent area should be marked, and the inflection point coordinates should be proposed.

5 Technical requirements of temporary boundary piles set should be proposed according to actual need of inventory survey.

6.0.3 At the stage of resettlement, the permanent boundary piles layout, pile measurement report and boundary piles layout diagram should be draw up. If there is some change in land requisition and resettlement, the scope of land requisition treatment should be reviewed, the diagram of land requisition and resettlement, the boundary of land requisition and resettlement should be adjusted. The processing scope of cultivated land and garden plot land in landslide area and riparian deformed area due to impoundment shall be determined according to the damage.

6.0.4 At the stage of operation and maintenance stage, the processing objects and scope in added impoundment-affected area due to impoundment shall be determined and analyzed according to the actral conditions and technical requirements.

Explanation of Wording in This Code

- 1** Words used for different degrees of strictness are explained as follows in order to mark the differences in executing the requirements in this code.
 - 1)** Words denoting a very strict or mandatory requirement:
“Must” is used for affirmation; “must not” for negation.
 - 2)** Words denoting a strict requirement under normal conditions:
“Shall” is used for affirmation; “shall not” for negation.
 - 3)** Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:
“Should” is used for affirmation; “should not” for negation.
 - 4)** “May” is used to express the option available, sometimes with the conditional permit.
- 2** “Shall comply with...” or “Shall meet the requirements of...” is used in this code to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.

List of Quoted Standards

GB 50201, *Standard for flood control*

NB/T 10129, *Specification of The Geological Report for Defining of Reservoir Affected Zone of
Hydropower Projects*

NB/T 35029, *Code for engineering survey of hydropower projects*

NB/T 35093, *Code for calculation of reservoir backwater of hydropower projects*

DL/T 5064, *Specifications of resettlement planning and designing for hydroelectric project*

