

ICS 23.040.70
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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 51072-2014

Code of design of 110 (66) kV~220kV smart substation

110 66 kV~220kV智能变电站设计规范

(English Translation)

Issued on: December 2, 2014

Implemented on: August 1, 2015

**Issued by: Ministry of Housing and Urban-Rural Development of the
People's Republic of China;**

**General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China**

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1 General

1 General

1.0.1

In order to standardize the design technical principles of smart substations, make the design of substations conform to the relevant national policies and regulations, and achieve safety, reliability, advanced application, reasonable economy, energy saving and environmental protection, this specification is formulated.

1.0.2

This specification is applicable to the design of new construction of smart substations (switching stations) with AC voltages of 110 (66) kV ~ 220 kV.

1.0.3

Smart substations should have technical features such as digitized information collection, networked communication platform, standardized information sharing, integrated system functions, compact structure design, intelligent high-voltage equipment, and visualized operating status.

1.0.4

The design of smart substations should adopt reliable, economical, integrated, energy-saving, and environmentally friendly technologies and equipment, and meet the industrial application requirements of easy expansion, easy upgrade, easy transformation, and easy maintenance.

1.0.5

The design of 110(66)kV~220kV intelligent substation shall not only comply with this specification, but also comply with the current relevant national standards.

2.0.1 Substation automation system (SAS)

The system of operation, protection and monitoring and control of the primary system of the substation realizes the automation in the substation, including the automation of intelligent electronic devices and communication network facilities.

2.0.2 Condition-based monitoring of equipment

Through sensors, computers, communication networks and other technologies, various characteristic parameters that reflect the normal operating state of the equipment can be obtained in time, and the expert system software with a certain algorithm can be used for analysis and processing, and the operating state and reliability of the equipment can be judged, so as to detect early Potential failures, aiding condition-based maintenance decisions.

2.0.3 Supervision and control system of substation

A system for continuous or periodic monitoring and control of systems or equipment in substations, through monitoring to verify that functions are being performed correctly, and to adapt their working conditions to changing operating requirements.

2.0.4 Generic object oriented substation event(GOOSE)

A mechanism to meet the fast message requirements of the substation automation system, abbreviated as "GOOSE". It is mainly used to realize information transmission between multiple IEDs, including adjusting tripping and closing signals, and has a high probability of successful transmission.

2.0.5 Sampled value (SV)

Based on the publish/subscribe mechanism, exchange related model objects and services in the sample data set, and the mapping between these model objects and services and ISO/IEC 8802-3 frames.

2.0.6 Smart terminal

An intelligent component, which is connected with the primary equipment by cables, and connected with secondary equipment such as protection and measurement and control by optical fibers, so as to realize the measurement and control functions of the primary equipment (such as circuit breakers, isolation switches, main transformers, etc.).

2.0.7 Integrated device integrated device

According to a certain integration principle, such as the controlled object, input data quality requirements or control strategy optimization, a system composed of one or several IEDs is formed by integrating different functions carried by different conventional IEDs, in order to achieve simplification The purpose of secondary equipment configuration, reducing repeated collection of information, and optimizing control strategies.

2.0.8 Prefabricated optical cable prefabricated optical cable

After factory pretreatment, one or both ends of the optical cable are connected with various types of optical fiber connectors as required, which can realize the connection of the prefabricated end at the construction site without fusion splicing point or direct connection of the optical cable.

2.0.9 Smart control cabinet

Cabinets for the installation of smart components. The intelligent control cabinet provides dust-proof, rain-proof, salt-fog-proof, electromagnetic-disturbance-proof protection facilities for each IED and network communication equipment of the intelligent components, as well as power supply, electrical interface, temperature (humidity) control, lighting and other operating facilities, so that Smart components are able to operate safely in the substation field environment for a long time.

3.1 Site selection

3.1.1

Site selection should comply with the current industry standard "Technical Regulations for Design of 220kV~750kV Substations" DL/T 5218.

3.1.2

The station site should be determined according to the requirements of the power system, in line with urban and rural planning, and after considering factors such as incoming and outgoing line conditions, equipment transportation, water supply, power supply, and flood and waterlogging prevention facilities, after technical and economic comparisons.

3.1.3

The station site should have suitable geological and topographical conditions, and should avoid unfavorable geological structures such as landslides, mud-rock flows, subsidence areas and earthquake fracture zones.

3.1.4

When selecting the station site, the land should be used rationally, the land should be saved, no or less cultivated land and land with high economic benefits should be occupied, and the amount of earth and stone should be reduced.

3.1.5

When selecting the station site, the overall coordination between the substation, adjacent facilities and the surrounding environment should be done well, natural reserves and cultural relics should be avoided, and mineral resources should not be covered, and written permission or agreement from relevant departments should be obtained when necessary.

3.2 General layout

3.2.1

The general layout shall comply with the current industry standards "Technical Regulations for Design of 220kV~750kV Substations" DL/T 5218 and "Technical Regulations for Substation General Layout Design" DL/T 5056.

3.2.2

The position and direction of the general plane, the access road, the drainage path, the direction and form of the line entry and exit shall be determined in combination with the environmental conditions of the site and planning requirements.

3.2.3

The general layout should be based on the process requirements, using the natural terrain, the layout should be compact and reasonable, and convenient for expansion.

3.2.4

The architectural layout should be planned in a unified manner according to the technical requirements and the use functions. It is advisable to adopt a joint building form in combination with the engineering conditions to improve the efficiency of site use and save land.

3.2.5

The type selection of power distribution devices should be adapted to local conditions. When the technical and economic indicators are reasonable, it is advisable to adopt a type of power distribution device that occupies less land.