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Operation and Maintenance of Power Plants and Grid

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PART 1
GENERAL

Article 1. Purpose

This regulation defines technical requirements to be fulfilled during operation and maintenance of network facilities, hydro power plants, and thermal power plants in order to secure public safety, environmental protection, and reliability of the facilities and relevant equipment.

Article 2. Scope of application

This regulation applies to power plants located in Vietnam and connected to the Vietnamese grids, and network facilities. The scope of application of this regulation is as follows.

1. Network Facilities
   All network electrical equipment that comes over 1,000V connected to the Vietnamese grids.
2. Hydro Power plants
   This regulation applies to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Grid.
3. Thermal Power plants
   This regulation applies to all thermal power plants located in Vietnam and connected to the National Power Transmission Network.

Article 3. Definitions

1. "*The Authority*" means Ministry of Industry and Trade in Vietnam.
2. "*The Owner*" means any person, unit, or municipality, or combination thereof, that owns power plants or network facilities and has a legal responsibility for operation of those power plants.
3. "*The Grid Operator*" means those who manage and operate the Vietnamese grid in load dispatch center.
4. *"Routine Inspection"* means check of facilities and equipment carried out by the Owner as the usual maintenance work during operation.
5. *"Emergency Inspection"* means extraordinary check of facilities and equipment after heavy storm, strong earthquake, large flood etc.
6. *"National gird"* is the electrical power system composed of power generating stations, transmission and distribution lines, power transformers and other relevant equipment, which is operated nationwide in order to manage and control supplying electrical power.
7. *"National Power Transmission Network"* means the transmission network of more than 110 kV voltages which is developed, installed, controlled and managed by the Government of Vietnam.

PART 2
ORGANIZATION AND SYSTEM FOR OPERATION

Chapter 1 Organizational Structure and Duties

Article 4. Power system

Power system includes power plants, power grids which have a close relation during producing, transmitting and distributing electricity continuously under a consistent control of operating mode.

Affiliated power system includes some power systems linked together by the common operating mode and under the same moderating control.

Article 5. Functions of individual units in power system

The essential task of individual units in the power system (including: power generation, transmission and distribution companies, load dispatching centers, repairs and services companies, etc.) shall:

1. Guarantee to provide stable and reliable power for the customers according to the provisions of applicable laws.
2. Maintain the quality and quantity of energy production: frequency and voltage of the electric current, pressure and temperature of steam under the provisions of current law.
3. Complete the load dispatching chart: load of each plant and the overall energy system; transmission and distribution power to customers and the movement of power among some of the power systems.
4. Follow the regulations on environmental protection.

Article 6. Obligations of individual units in power system

Each individual unit in the power system shall thoroughly understand the characteristics of power production and its role in the national economy and social life; shall grasp and strictly observe labor disciplines, technological procedures, follow this regulation on safety practice and other related regulations of authorized levels.

Article 7. Internal responsibilities of individual units in power system

Power plants, electric companies, electric supply organizations and power grid operating organizations shall guarantee to:

1. Build their own documents in order to implement this regulation and carry out measures aiming at the continuous contribution to the development of power system to satisfy the power demand of national economy and social life with the principle of one-step ahead development for power system.
2. Strive to improve productivity, achieve lower cost in production, transmission and distribution, and improve the readiness of equipments.

3. Apply and seize new techniques, organize the production and working in a scientific manner.
4. Improve professional qualification of staff, employees; disseminate advanced methods of production and experience in technical innovations; promote ideas and patents; disseminate form and method of positive competition.

Chapter 2 Acceptance of Equipment and Plants for putting in Operation

Article 8. Operating condition of power works

Power plants and network facilities which have completed, finished their expansion, or completed in separate phases shall not be allowed to operate without the checking in line with relevant regulations.

Article 9. Acceptance of operation of power works

Acceptance to operate power facilities or component of these works is carried out according to the number of actuating assembly which includes all work items of primary, secondary production, servicing, repairing, transportation, storage, communication, underground works, wastewater cleaning works, public construction works, dwelling-houses, dormitories, common dining-room, medical station and other construction works to ensure that:

- The output of actuating assembly is consistent with the design,
- The regulation of law on living and hygiene conditions for operators and repairing staff are observed,
- Other regulations relating to actuating assembly are observed., and
- The water source and surrounding environment are protected.

Article 10. Acceptance procedure

Before accepting to operate the power equipment, the Owner should perform the following tasks:

- Run test each component and accept each part of the equipment of machine assembly,
- Start the primary and secondary equipment of machine assembly, and
- Run test the whole equipment.

Before operating in dwelling-houses and construction works, it is required to carry out acceptance for each part, including underground works and acceptance according to the number of actuating assembly.

Article 11. Acceptance of equipment

Acceptance after various testing and running test of each part, acceptance for each component of machine assembly and construction works, starting, checking the readiness of equipment before running test of the whole equipment is carried out by subcommittees of Acceptance Committee.

Acceptance to operate equipment and construction works are carried out by authorized Acceptance Committee according to applicable regulations.

Article 12. Acceptance of component

The trial run of each part and acceptance for each component of machine assembly are carried out by Acceptance Committee according to the blueprint after completing the assembling work of this equipment. When accepting each part, it is required to test the implementation of Regulations on construction, regulations on testing the steam, technical safety standards, explosion prevention and fire prevention standards, "Electric equipment standards", instructions of manufacturers, instructions to assemble the equipment and other legal documents.

Article 13. Acceptance for completion

After running test of the whole equipment and fixing all detected defects, the Acceptance Committee of State level carries out the acceptance for equipment and dwelling-houses, construction works relating to this equipment and makes a report. The Acceptance Committee of Competent Authority level regulates the temporary operating period of equipment. During this period, it is required to complete all necessary experiments, adjusting and completing the equipment in order to ensure the operation of equipment according to the design specifications.

For equipment of the first batch of manufacturing, the running test period is regulated on the basis of combination of completing, adjusting and running test of this equipment.

Article 14. Handover of technical documents

When the operating unit receives the equipment, the assembling unit or manufacturer is required to handover the following technical documents, which are related to the assembled equipment, to the operating unit:

- Designing documents (including drawings, presentations, processes, technical documents, executing and monitoring log of designing organization) which have been modified during construction, assembling and adjusting period, and handed over by designing, constructing and assembling organizations;
- Acceptance reports of components and underground works which are handed over by constructing and assembling organizations;
- Test reports of automatic firefighting equipments, surge arresters shall be delivered by testing unit.
- Documents of manufacturer (including processes, drawings, diagrams and other documents related with equipment) shall be delivered by assembling unit.
- Reports of measurements, calibrations and principle diagrams test shall be delivered by measurement and calibration unit.
- Test reports of safety systems and air ventilating systems shall be delivered by calibration unit.

- Testing and initial checking reports of the metal conduits, main parts of generator shall be delivered by testing and checking unit.

Chapter 3 Personnel Preparation

Article 15. General requirements for personnel preparation

The personnel preparation of electric industry related enterprises and agencies shall be carried out according to regulations and instructions relating to personnel preparation in power plants, power grid plants.

Leaders of electric companies, enterprises and agencies belong to electric industry shall organize and audit regularly the personnel preparation.

Article 16. Knowledge test for personnel

The knowledge test for technical workers and staff that has a direct relation with the operation and maintenance of objects under the management of boiler tester shall be carried out according to the requirements of boiler tester.

Chapter 4 Management of Material and Equipment

Article 17. Keeping of necessary documents

Essential technical documents for electricity activities shall be kept properly. The documents that shall be kept are stipulated in each part (hydropower, thermal power, and network).

Article 18. Provision of related standards

Each Power plant, Power company, Distribution and Operation Unit shall prepare a list of the standards that are related to inspection, repair, and maintenance properly.

Article 19. Attachment of rating plate

Each piece of equipment of electric power facility shall be labeled with its rating plate.

Article 20. Numbering of equipment

Each piece of equipment of electric power facility including pipelines and bus-bar systems shall be numbered.

Article 21. Record and Indication of parameter for operation

Parameters of facilities shall be carried on the control panels that are used for operation in control centers and other control rooms. They shall also be recorded and shall be always available.

Article 22. Installation of equipment for record

In dispatching centers of power grid and central control rooms of power plant, recorders shall be installed to record the data in dealing with emergencies.

Chapter 5 Safety Technology

Article 23. Compliance of safety standards

Arrangement for operation and repair of electric power facilities shall comply with the requirement of ordinances of Ministry of Industry and Trade and other regulations.

All workers and staffs shall understand and comply with requirements of relevant safety regulations.

Article 24. Registration of boiler, pressure tank and crane

Boilers, pressure vessels, and cranes that are subject to application of State's regulations shall be registered in accordance with regulations of Ministry of Industry and Trade.

In case where the above-mentioned equipment is not subject to application of State's regulations, the owner shall take responsibilities by themselves to guarantee that equipment's safety.

Article 25. Inspection of safety protection system

Automatic protecting equipment and safe equipment and appliances for operation shall be inspected in accordance with existing regulations.

Article 26. Responsibility for safety and hygiene

If indirect staffs, who are related to realization of labor safety technical standards and hygiene, do not administer their responsibility and do not carry out necessary measures to prevent occupational accidents and infection, and if individuals violate occupational safe and hygienic regulations, they shall bear appropriate responsibility for accidents and infections during the work.

Article 27. Investigation and report of accident

Each accident of facilities, occupational incident and accident or breakdown in equipment operation shall be investigated thoroughly, reported and listed timely, accurately and sufficiently under the existing regulations as well as counted in statistics according to the investigation procedure and listing procedure of Ministry of Industry and Trade. At the same time, solutions for dealing with shall be promptly given to preclude such incident and accidents from reoccurring.

Article 28. Training of first-aid measure

All personnel who work in installation and repair of power plants and network facilities shall be trained with first-aid measures for people who receive an electric shock.

Article 29. Preparation of first-aid dressings

First-aid dressings shall be prepared in each workshop, substations, and maintenance offices whose work may involve dangerous and noxious places.

Article 30. Outfit for electrical work

All staff shall wear pertinent appliances and coveralls when they are in work. The work means those in indoor and outdoor work and maintenance work of substations, work in power plants and in manholes and the like.

Chapter 6 Fire Prevention Equipment

Article 31. Fire prevention responsibilities in electrical facilities

Layout of power plants and network facilities shall fully consider safety in fire prevention.

The responsible person who bears overall responsibility in safety in fire prevention and fire fighting shall be assigned.

The assigned person shall be responsible for arrangement of implementing measures on fire prevention, check of abidance in fire prevention system, availability of automatic fire alarming system and firefighting equipment and methods, and arrangement of practicing firefighting.

Article 32. Implementation of firefighting training

By setting up plans for installing fire prevention equipment and implementing them, relevant regulations on fire prevention shall be observed.

Firefighting practice shall be organized periodically as regulations.

Article 33. Installation of fire prevention equipment

Installation and improvement shall be carried out based on the installation plan of fire prevention equipment approved by the relevant authorities.

The fire prevention equipment shall be well maintained and be easily recognized. It shall be checked periodically or replaced as required.

If automatic firefighting equipment is installed, it shall conform to relevant regulations.

Chapter 7 Executing Responsibility

Article 34. Compliance with technical standards for operation

Understand correctly and observe this document is mandatory for staff and employees of electric companies, electric supply organizations or power grid operating organizations operating inside local electric companies, power plants, power transmission company, steam system, repair enterprises, moderation centre as well as for related organizations, individuals.

Article 35. Investigation of accident *(deleted and combined with Article 27)*

PART 3
PLAN, HOUSES AND POWER PLANTS

Chapter 1 Plan

Article 36. Hygienic condition for plan, house and powerhouse plant

For smooth operation and upkeep of hygienic condition for plan, houses and works, it is necessary to abide requirements on environmental protection and keep the following items in good conditions:

1. Surface and underground drainage system for the whole plan of power plant, substation and relevant facilities;
2. Dust precipitating system and ventilating system;
3. Waste water treatment systems;
4. Water supply system and drainage system;
5. Sources for domestic water, reservoirs and protecting system for water sources;
6. Railways and roads in yards of power plant, substation and relevant facilities;
7. Fences, illumination for parks, other cultural works and public works;
8. Systems for monitoring underground water level.
9. Lighting system of power plant, substation and relevant facilities.
10. Oil collecting system and hazardous waste collecting system

Article 37. Indication of water route, gas pipeline and cable route

Clear, visible and solid warnings shall be displayed for underground water routes, wastewater system, gas pipelines and cable routes.

Article 38. Water treatment

Wastewater and drained rainwater in the yard shall be lead to water treatment system. In case that water discharged to reservoir has a possibility to be contaminated with pollutant such as oil and chemicals, water quality shall be checked in accordance with industrial hygiene regulations.

Article 39. Stability of plan

In case that the settlement, landslide and fracture are detected on the plan, proper measures shall be carried out to exclude or mitigate causes for above-mentioned phenomena and tackle their consequences.

Article 40. Railway and road

Railways and relevant works located in the yard and the area under the control of the power plant shall be managed and maintained in line with regulations of railways. Management and maintenance

of roads in the same area shall be also in accordance with the technical regulations and standards of transport and communication sectors.

Chapter 2 Houses, Power Plant, Technical and Hygienic Equipment

Article 41. Principles in maintenance

Power plants and relevant facilities, houses and related structures shall be maintained in good condition, and secured for durable operation, reliable as design. They shall satisfy occupational safety and industrial hygiene for staffs.

Article 42. Routine and emergency Inspection of houses, works and equipment

The owner shall monitor the condition of houses, works and equipment to secure reliable operation, and check them comprehensively to detect damages and potential failure periodically as routine inspections. In case that the breakdown or natural hazards such as fire, earthquakes, heavy storm and flood would happen at the area where electrical facilities and equipment are installed, emergency inspection shall be carried out immediately after the incidents.

Article 43. Check of houses and works on particular ground

It is necessary to check carefully and continually the condition of houses and works constructed at new earth-filled area, settlement area and the location where vibration appears frequently during operation.

Article 44. Check of durability of houses and works

Once keeping a close watch on durability of houses and works, it is necessary to check the condition of supporting column, expansion gaps, welded seams, joints, structures of reinforced concrete, structures and parts affected by active load and heat.

Article 45. Countermeasures for fractures and damages

In case that fractures or damages on structures are detected, subsequent actions shall be selected carefully according to the degree, location and causes of fractures and damages. Excluding cases that the defects are structurally and functionally negligible or urgent repair works are executed immediately, careful successive inspection shall be carried out for detected fractures or damages. Depending on the conditions of defects, proper monitoring equipment such as plumb lines, crack gauges and displacement meters etc. shall be installed immediately. A series of investigations and countermeasures shall be recorded correctly for proper maintenance.

Article 46. *Check of chimney (deleted)*

Article 47. Alteration of facilities

It is prohibited to alter facilities like piercing, arranging heavy machinery and materials, and installing ducts and pipelines, which may damage the stability and safety of facilities. Overload or alteration shall be permitted on the condition that the safety would be confirmed by design calculation. If needed, such structures shall be reinforced properly.

At each section in floor surface, it is necessary to recognize allowable limit-load based on design and put instructions at visible place.

Article 48. Corrosion protection of metal structures

Corrosion protection status of metal structures of houses and works shall be checked and kept in good condition.

PART 4
CIVIL WORKS, WATER SOURCES, AND MANAGEMENT OF HYDRAULIC TURBINE AND POWERHOUSE

Chapter 1 General Provisions

Article 49. Definitions

In addition to the definitions prescribed in Article 3, the following definitions also apply in the Part 4.

1. *"Air valve"* means a device that provides a mechanical vent allowing air flows in and out of a penstock in order to secure safety against watering-up, dewatering and some conditions during operation.
2. *"Automatic protection system of penstock"* means whole ventilating system installed at penstock to secure safety, which consists of air valves and appurtenances such as standpipes and ventilation pipes.
3. *"Civil works"* means structures constructed with earth, rock, concrete or combination thereof.
4. "*Headworks*" means structures constructed at the front side of waterways to take water from a river, a lake and a reservoir. Usually it includes an intake structure, intake gates and a facility to flush sedimentation;
5. *"Hydro-meteorology agency"* means the Headquarter or branches of National Center of Hydro Meteorological Forecast.
6. "*Intake*" means an inlet structure of water, which is usually installed at the most upstream end of waterway. In case of a pumped storage power plant, an intake structure means a structure located at the upstream end of the waterway in an upper pond through which water is taken from the upper pond during generating operation and it functions as an outlet during the pumping operation;
7. *"Outlet"* means a structure located at the downstream end of the waterway, through which water can be freely discharged to the reservoir or the river. In case of a pumped storage power plant, an outlet means a structure located at the downstream end of the waterway in a lower pond through which water is discharged to the lower pond during generating operation and it functions as an intake when pumping operation;
8. *"Outlet works"* means one of dam appurtenances that release water from a reservoir in order to carry out water supply, drawdown of reservoir;
9. *"Pressurized structure"* means a structure that is designed for non-atmospheric external and/or internal pressure such as steel penstocks.
10. *"Reservoir"* means a pond with capacity enough to regulate natural river flow for water use in some period such as season or year;
11. *"Waterway"* means a structure to lead water with or without pressure. It consists of open channels, tunnels, pipe conduits or combination thereof.

12. *"Small dam"* means the dam with height less than 15 m calculated from the foundation surface to the dam crest or the dam of the reservoir with capacity less than 3,000,000 m^3 (three million cubic meters).

13. "*Large dam*" means the dam with height equal or higher than 15 m calculated from the dam foundation surface to the dam crest or the dam of the reservoir with capacity equal or bigger than 3,000,000 m3 (three million cubic meters).

Article 50. Preparation and preservation of necessary documents

1. The Owner shall prepare report on the following items and preserve them properly:
   - Operation results on water release from spillway and outlet works;
   - Maintenance results such as repair work of civil works and mechanical equipment;
   - Routine inspection and periodic inspection results;
   - Emergency inspection results;
   - Instrumentation measurement results of civil works and mechanical equipment;
   - Hydrometeorological observation results.
2. The Owner shall preserve following documents in good condition in order to operate and maintain civil works and appurtenant equipment properly:
   - Fundamental legal and administrative documents such as operation manuals and Water right;
   - Design reports and principal memoranda on design condition, design criteria, assumptions;
   - Technical specifications of structures and equipment;
   - Construction history records;
   - Reports and records at the initial impoundment;
   - As-built drawings;
   - Precedent hydrometeorological data;
   - Precedent monitoring data on performance of structures;
   - Laboratory reports on materials, hydraulics;
   - All previous reports and records on maintenance history, and official and independent periodic inspections.
3. The Owner shall prepare the monitoring plan of individual dams describing the following issues:
   - Item, method and frequency of dam monitoring
   - Measuring program of instrumentation available at each dam
   - Responsible staff

Chapter 2 Civil Works and Mechanical Equipment for Civil Works

Section 1 Civil Works

Article 51. Taking over

1. In addition to the final design reports and construction reports, the Owner shall take over the following documents from contractors and design firms for smooth operation and maintenance of hydro power plant:
   - All technical data for civil works such as construction history, surveying data and testing data obtained during construction;
   - Instructions and installation records of measuring instruments installed at the civil works;
   - Main principles, which were agreed upon by the related parties on water usage in reservoir;
   - Hydraulic characteristics of spillway, hydrological characteristics of natural and regulated runoff.
2. After taking-over, the Owner shall carry out the first check of civil works as the periodic inspection for overall power plant facilities according to the technical regulations Volume 5 in order to grasp the initial state for periodic inspection.

Article 52. Principles of operation and maintenance

1. Civil works of hydro power plant (dam, weir, tunnel, channel, penstock, intake, spillway, stilling basin, powerhouse, etc) shall be operated and maintained so as to fulfill the design requirements on safety, stability, durability and sustainability provided in the Technical Regulations.
2. Headwork's and pressurized structures including foundation and adjacent parts shall fulfill the design requirements on waterproof.
3. Operation of civil works shall ensure safety, sustainability, consecutiveness and economy of equipment.
4. Damages of civil works, which may cause the loss of lives and property, and may harm equipment, facilities and environment, shall be fixed immediately.
5. During implementation of maintenance, equipment conditions and maintenance procedures shall be recorded.

Article 53. Prohibition of irregular operation or alteration against design

Irregular operation or alteration of civil works against the design shall not be allowed except for the cases approved by the Authority.

Article 54. Cares for concrete civil works

1. Concrete civil works shall be prevented from being damaged by erosion, intrusion, fracture, distortion, deterioration and other abnormal phenomena caused by water, earth pressure or other

loads. If damages or deterioration of concrete affected by water flow, water quality or water level change are anticipated, concrete durability shall be checked.

2. Once detecting damages in structural stability or water-tightness, or reduction of durability of structures comparing to the design, proper restoration or reinforcement solutions shall be applied. Documentation for maintenance process shall be prepared.

Article 55. Cares for earth-rock fill works

1. Occurrence of erosion or damages of earth-rock fill works caused by surface flow, seepage, precipitation, plants, animals and lives such as termite etc. shall be checked periodically.
2. Plants and bushes shall not be allowed to develop on crest and slopes of dam and dykes against the design specifications.
3. When erosion or damages are found on earth-rock fill works, they shall be repaired and reinforced immediately.

Article 56. Care for seepage line in earth fill works

If seepage line inside earth fill dams and dykes is higher than that in the design, existing drainage system shall be checked or new drainage system shall be installed, or sufficient reinforcement shall be carried out in order to avoid landslide or collapse due to piping.

Article 57. Cares for drainage system

1. Discharge meters equipped in drainage system for seepage shall be kept in good condition and work properly in order to grasp seepage rate and to check effectiveness of drainage system.
2. Seepage water shall be discharged consecutively.
3. In case that fine solids is detected in seepage water from earth-filled works or foundation, proper investigations and countermeasures shall be carried out immediately in order to avoid internal erosion due to piping.

Article 58. Cares for spillway

1. Spillway shall always be kept free of impediment such as debris, landslide deposits, or plants in order to secure the discharge capacity as designed.
2. Severe cracks, erosion and deterioration shall be repaired in order to prevent successive failure.
3. Undermining of spillway outlet shall be checked periodically. Proper measures shall be taken to protect dam and other structures located near spillway outlet against undermining if necessary.

Article 59. Operation of canal

In order to maintain stability and hydraulic characteristics of the canal, sedimentation or erosion in canal shall be prevented by proper operation and maintenance.

Article 60. Water filling and dewatering

1. Filling water and dewatering in reservoir, canals, tunnels and penstocks shall be carried out with proper rate so as not to damage stability and safety of those facilities. Especially the first water-filling shall be carried out with very careful check of civil works and equipment.
2. Allowable rate of water filling and dewatering shall be determined properly considering acting pressure, characteristics of facilities and related geological conditions.

Article 61. Prevention from erosion

Adequate measures to prevent erosion and wash-away of civil works or foundations shall be carried out to avoid dangerous consequences, if those risks are prognosticated considering runoff conditions of the river.

Article 62. Condition of penstocks

The following items shall be checked during operation of hydro power plant, and countermeasures shall be taken to secure safety of penstocks and appurtenances if unfavorable phenomenon is found:

1. Checking appearance of exposed penstocks such as damages due to rock falls or movement of supports;
2. Checking vibration of penstocks and appurtenances, and taking necessary countermeasures such as changing stiffness or adding supports in case that damages due to intensive vibration are anticipated;
3. Checking conditions of drainage around embedded penstocks, where decrease of external pore water pressure is assumed in the design;
4. Checking normal working condition and leakage of expansion joints;
5. Checking conditions of all supports, anchors and their abutments;
6. Checking abnormal phenomena such as new opening cracks, new spring water, and other symptoms of instability of ground in the area near penstocks;
7. Checking quality of the water flowing into a penstock;
8. Checking an automatic protection system of penstocks so as to work reliably.

Article 63. *(deleted)*

Article 64. *(deleted)*

Article 65. *(deleted)*

Article 66. Emergency programs

1. Each hydropower plant shall have its own rules on fixing emergency cases such as breakdowns of civil works, heavy storm, heavy flood, or severe earthquakes.
2. The board on flood control shall prepare plans for emergency or special flood discharge if it occurs and shall inform relevant agencies of it.

3. For the dams which belong to flood control projects, prior to the flood and rainy season each year, the dam Owner shall prepare or update or supplement the alternative for protection against floods and typhoons, and shall submit the alternative to the State competent organization for approval.
4. Throughout the flood and rainy season, the dam Owner shall maintain communication system in good working conditions and report the situation to the higher level of The Steering Committee on prevention and protection against flood and typhoon and State competent organization, as specified in the Regulation.

Article 67. Recheck of safety

When fundamental design conditions such as design flood or design earthquake at the site of hydropower plant are revised by the Authority, stability and safety of civil works shall be rechecked according to revised conditions. If obvious danger is anticipated, necessary measures shall be investigated and taken.

Section 2 Check of Civil Works' Condition

Article 68. Routine inspection and emergency inspection

After commencement of operation, in order to confirm the safety of civil works and appurtenant mechanical equipment, state and working conditions of those works and equipment shall be checked by routine inspections. In case that unexpected incidents which may have caused damages on the civil work facilities such as earthquakes, heavy storm, etc. occurred, an emergency inspection of civil works and appurtenant equipment shall be carried out right after their occurrence. A detailed inspection shall be carried out when civil works and appurtenant equipment are heavily damaged.

Article 69. Revision of monitoring program

1. At the operation stage, monitoring program shall be revised properly on the following items depending on condition of civil works:
   - Quantity of measuring devices;
   - Type of measuring devices;
   - Target and location to be measured or tested;
   - Measurement intervals.
2. Records of installed measuring devices shall be always updated in point of types, quantity, calibration data, location, installed date, initial value, maintenance history, and so on.
3. Measuring instruments shall be calibrated periodically.

Article 70. Investigation of monitoring data

The provisions in Paragraph 1 and Paragraph 2 in this article are applied to the large dam and, for the small dams, the monitoring shall be made for water levels and other measurements specified by the design consulting company.

1. Monitoring of the major civil works, of which damages will affect safety and operation of the power plant, shall be conducted regularly for the items specified below and the monitoring results shall be investigated periodically to evaluate state, behavior and working condition of civil works:

   a) Concrete dams
      - Appearance of dam body and its abutment in terms of leakage and seepage water, deformation, erosion, cracks deterioration and weathering
      - Deformation survey in terms of horizontal and vertical displacement, bending, shear movement and joint opening
      - Measurement of stress in dam body
      - Measurement of temperature in dam body
      - Measurement of leakage and seepage water
      - Measurement of uplift pressure
      - Measurement of groundwater level at observation wells arranged in the surrounding ground of the dam
      - Seismic monitoring at dam body and foundation

   b) Fill Dams
      - Appearance of dam and its abutment in terms of leakage and seepage water, deformation, cracks, sliding, depression, erosion and weathering of embankment material
      - Deformation survey in terms of horizontal and vertical displacement and settlement of dam body
      - Measurement of settlement and deformation of impervious concrete slab
      - Measurement of leakage and seepage water
      - Measurement of seepage line in dam body for homogeneous type earthfill dam
      - Measurement of pore pressure in dam body
      - Measurement of groundwater level at observation wells arranged in the surrounding ground of the dam
      - Seismic monitoring at dam body and foundation

   c) Other civil works
      - Settlement, movement of civil works and their foundation for major open structures;
      - Distortion and cracks inside and surface of civil works for major structures;
      - Condition of joints and construction gaps of civil works for major structures;
      - Influence of runoff on civil works such as erosion and abrasion;
      - Landslide and sedimentation, growth of plant in canals and reservoirs.

2. Depending on conditions of civil works, the following surveys and investigations shall be carried out in addition to the normal inspection:

   - Vibration of civil works due to water flow and power generation at intake, outlet, penstock and powerhouse;
   - Durability and waterproof of concrete at concrete dam and other concrete structures;

- Behavior of structures due to thermal stress at concrete dams and exposed penstocks;
- Corrosion of metal and concrete at major concrete structures;
- Conditions of welded seams of gates and exposed penstocks;
- Erosion of civil works due to cavitation at spillways and waterway structures.

3. When working conditions of civil works become severe by some major changes in operating rules or natural conditions, additional surveys shall be carried out to check stability and safety of civil works.

Article 71. Location and geometrical features

In order to detect abnormal behavior of civil works, exact location and geometrical features of civil works shown below shall be clearly indicated, managed and checked periodically by a survey work etc.

- Base marks and mediate ones of civil works such as dams, headworks and powerhouses;
- Location and elevation of anchor blocks of exposed penstocks;
- Geometrical features such as length, starting points, terminal points, radius of curves, and location of submerged and embedded equipment for dykes, dams, inlets, canals, and tunnels.

Article 72. Protection of measuring devices

Measuring instruments and relevant appurtenances shall be properly maintained and operated, and protected from natural hazards and artificial obstruction.

Article 73. Board on flood control

The Board on flood control shall be organized for each hydro power plant before flood season annually, in order to investigate and examine thoroughly activities of flood control for civil works and equipment, especially spillway gates, outlet works and procedures to release flood.

Section 3 Mechanical Equipment for Civil Works

Article 74. General requirement

Mechanical equipment for civil works (valves, gates, trash racks and enclosed machineries), remote controlling or automatic system and their signals, as well as gate hoists shall be maintained to be always in good condition and in readiness for operation.

Article 75. Conditions of gates

1. Metal parts of gates and valves shall be prevented from rust and wear;
2. Movement of gates shall be smooth and steady without being stuck or vibrant, or without malfunction;
3. Positioning of gates shall be correct;

4. Water leakage from gates shall not be excessively large comparing to the amount at the initial state;
5. It shall not be allowed to keep gates under dangerous operating conditions for long time, such as intensive vibration under partial open of gates.

Chapter 3 Management of Water Sources in Powerhouses, Assurance of Meteorology and Hydrology

Section 1 Water Regulation

Article 76. Principle of exploitation of water resources

For exploitation of water resources in relation to power generation, water demand of other economic sectors (navigation, irrigation, aquaculture, water supply for life and industry), flood control, and requirements for environmental protection shall be taken into account.

Article 77. Plan on water use

1. For each hydro power plant, a plan on water use throughout the year shall be prepared and approved by the Authorities in advance.
2. This plan shall specify discharge and monthly reservoir water level.
3. Water use plan shall be reviewed and revised, if necessary, quarterly and monthly based on hydrological forecast and working condition of hydro power plant.
4. In case that a river system covers some hydro power plants or cascade power plants, rules on runoff shall be operated so that it can reach maximum efficiency of the whole power system and simultaneously satisfy water demand of other sectors following the approved inter-operation procedure for the reservoirs.

Article 78. Water discharge and storage regime

1. Operation of reservoir shall ensure
   - After reservoir water level reaches the normal high water level, fluctuation out of the rules established in accordance with the provision in Article 77 Paragraph 4 shall be allowable in case that special requirement of water consumers and for multi-purpose reservoir provided that water level in the reservoir shall not be higher than water level stipulated by the State competent management organization;
   - Suitable conditions for release of surplus water and sediment;
   - Necessary conditions for water transportation, aquaculture, irrigation and water supply;
   - Balance of the best efficiency and benefits for entire energy system and satisfaction of water demands for other economic sectors;
   - Rules of water discharge, fulfillment of requirements on safety and reliability during operation of civil works and safety for downstream;

2. All water demands of consumers, who are out of energy sector and affected by reservoir operation due to energy demand, shall be adjusted and specified clearly in rules on water usage of reservoir.
3. During operation, principles agreed upon by the related parties on water usage in reservoir shall be abided.
4. In flood season, the operation of reservoirs shall be prioritized for ensuring dam safety, and the flood control and water filling shall be in compliance with the functions of the projects.

Article 79. Adjustment of hydraulic characteristics of spillway and runoff

Hydraulic characteristics of spillway and hydrological characteristics of natural and regulated runoff shall be established based upon the actual data at the operation stage.

Article 80. Operating manuals for spillway

1. Discharge from the gated spillway shall be controlled according to the operating manuals approved by the Authority in advance.
2. A dry test of spillway gates shall be conducted at least once a year before the flood season.
3. Test operation shall be conducted for the gates and back-up gates which are not regularly operated or in the period of no regular operation.

Article 81. Spillway operation

1. Increase of discharge from gated spillway shall be controlled so as to prevent the hazard at the downstream due to rapid rise of water level.
2. In case of water release from spillway or outlet works, the power plant shall inform related gauging stations and local authorities in advance.
3. As for discharge through hydraulic turbines, it is not required to regulate change rate of discharge and to inform related gauging stations and local authorities in advance.

Article 82. Discharge capacity for design flood and check flood

1. For discharging design flood and check flood, outlet works under management of other sectors such as ship lock shall not be counted in the design discharge capacity but shall be counted in a whole discharge capacity for the actual operation.
2. In the case of actual operation referred to in the preceding paragraph, it is necessary to set up rules for identification of discharging conditions and operation sequence by negotiating with related organizations that manage those outlet works.

Article 82-a1. Warning on dam failure

In case of an accident which could make unsafe condition in dam structure, the rescue works shall be urgently performed with highest priority and efforts for keeping safety of the project and downstream area to minimize damage.

In case that dam failure is anticipated, suitable measures such as a warning system by sound or broadcasting, an information system to community centers, an emergency evacuation plan, etc., shall be taken to minimize damage to the downstream area.

Article 82-a2. Measurement of downstream water level

The Owner shall measure the downstream water level of a dam or the tailrace water level to observe the head for power generation.

Article 82-a3. Protection of downstream areas from inundation

In case water discharge from a reservoir causes sudden increase of water level downstream of spillways, the Owner shall establish measures to announce in advance in order to ensure safety of human lives and property.

The Owner shall prepare alternatives for prevention and protection of downstream areas from flood and typhoon and submit the alternatives to the authority, in order to cope with the inundation situation due to urgent water flood discharge or situation of dam break, in order to protect human lives and to mitigate damages of human lives and property of the downstream areas of the dam.

Section 2 Environment in Reservoir

Article 83. Sedimentation in reservoir

Sedimentation in reservoir shall be checked by survey periodically. If flood hazard due to excessive sedimentation is anticipated at the upstream of the reservoir, appropriate solution shall be applied, i.e. reinforcement of banks, construction of protective works, or other mechanical ways such as dredging.

Article 84. Restriction on use of chemical herbicide

If chemical treatment is applied to remove undesirable plants at riverside or around reservoir, the Owner shall fulfill the environmental regulations.

Article 85. Monitoring of reservoir water quality

Reservoir water quality shall be checked periodically according to the environmental regulations.

Section 3 Hydro-Meteorological Activities

Article 86. Use of hydro-meteorological data for safe operation

1. Hydro power plants shall be operated safely by using hydrometeorological data and forecast supplied by the hydrometeorological agencies as well as those obtained by own measurement.
2. The dam Owner shall carry out measurement and gathering meteorological-hydrological data of the catchments of reservoir.
3. Rules on hydro-meteorological surveying in each power plant shall be in line with standards of hydro-meteorological sector.

Article 87. Grasp of daily runoff data

1. The Owner shall quantify daily runoff through civil works and daily discharge through hydraulic turbines in each hydro power plant.
2. Hydro power plants shall collect and summarize actual result of runoff through ship lock, fishways and other works related to waterway.
3. Daily discharge through civil works and hydraulic turbines shall be given to hydro-meteorological sector by request.

Article 88. Survey of operating conditions and criteria

Methods and time to survey the following items shall be clarified in each hydro power plant:

1. Upstream and downstream water level of weir, intake and canal;
2. Water discharge through civil works and hydraulic turbines;
3. Water turbidity and sedimentation in reservoir;
4. Temperature of water and air;
5. Water quality for power generation use and discharge from civil works.

Article 89. Reliability and accuracy of gauging stations

Gauging stations shall be maintained properly by confirming the following items so as to keep reliability and accuracy in measurement of runoff:

1. Maintaining reliability of measuring instruments;
2. Grasping accurate shape of cross section of river;
3. Grasping relationship between water level and discharge properly;
4. Maintaining stability of gauging stations.

Article 90. Notification for violation of regulation on water use

In case that a hydro power plant discharges contaminated water and violates regulations on water usage in an emergency situation, it shall be informed to the hydro-meteorological agencies and the environmental management agencies immediately.

Chapter 4 Hydraulic Turbine/Generator

Article 91. Oil treatment *(moved to Article 382-a1 in Part 6)*

Article 92. Efficient operation

Once operating hydraulic generators, it is necessary to make sure their consecutive operation, optimal efficiency of hydropower plant corresponding to proposed load and operating mode in power system, as well as readiness of receiving rated load.

Article 93. Changeable operation mode

As for hydraulic generators that can be operated in generation and/or in synchronous condenser and/or pumping mode, it is necessary to equip remote control and automatic controlling system to shift operating modes.

Article 94. Joint operation

In case the power plant is equipped with power joint control system, the joint mode operation shall be kept until the order of stop.

Article 95. Protection of power plant

After repairing, once hydraulic generator is put into operation, it is necessary to check comprehensively as existing regulations the following items: main equipment, protecting equipment for technology, interlocks, auxiliary devices, oil, air and cooling water systems, regulator, and remote control, testing and measuring devices, and means of telecommunication.

Article 96. Operation approval

Based on manufacturers' data and separate test reports, the owner shall review the numeric values defined and put the plant into processes of start-up and normal operation of the ~~g~~enerator.

Article 97. Vibration

<The provisions of this article shall refer to Article 98-a1 of Chapter 4 of Part 3 in Vol.5>

Article 98. Runner inspection

The runner inspection shall be carried out to check cavitation corrosion, erosion and crack, together with inspection for the spiral casing, wicket gate and draft tube.

When works need being implemented in runner pit, it is imperative to discharge all water in runner pit and close all valves and/or gates related to runner pit.

Article 99. Hydraulic pressure inside penstock

Pressure inside penstock at load rejection shall not be excess the designed value.

PART 5
MECHANICAL AND THERMO EQUIPMENT OF POWER PLANTS

Chapter 1 General Provisions

Article 100. Documentation

The Owner of facilities should keep and maintain following technical materials in each thermal power plant.

1. Minutes on granting land.
2. Minutes on set up foundation and profile of boring holes.
3. Minutes on check and acceptance of underground works.
4. Minutes (or records) on settlement of houses, works and foundations for installing equipment.
5. Check-list on testing equipment of fire fighter.
6. Completed work documents (record drawings, explanations, etc.), with all of the design modifications to change eventually.
7. Technical history of houses, works and equipment.
8. Plan for layout of firefighting equipment and means.
9. Records of engineering work
10. Results of Completion Inspection and Periodic Inspection
11. The overall plan area for signs of housing and location of works, including underground works.
12. Information about the failure of the device.

Chapter 2 Fuel Transportation and Supply

Article 101. General provisions

Fuel transportation and supply shall satisfy the following points:

1. Fuel transportation to power plant shall be carried out in accordance with regulations on management and operation of railway and waterway of Ministry of Transport
2. Fuel receiving volume and quality shall be confirmed;
3. Fuel shall be kept in good situation as regulations with the lowest loss;
4. Fuel for boiler or pulverized coal processing system shall be supplied timely.

Article 102. Specification of fuel

It shall be endeavored to procure fuel in which the ingredients differ from design specification very little in order to achieve the design performance and environmental performance.

In the fuel supply contract must specify:

1. For coal: codes, grouped by measurements of ash and ash limit, volatile matter content, limited heat value, grain size and maximum grain size, maximum moisture;
2. For liquid fuel used for boilers: codes and sulfur content limit.
3. For liquid fuel gas turbines used for external above requirements moisture, ash, content of mechanical impurities, vanadium, sodium, potassium, calcium, lead are required;
4. For gas boilers used for: low heat energy of gas, also for gas turbines: Limit change heat energy and density of the gas, sulfur content, mechanical impurities and condensate.

Article 103. Examination of fuel quality

In power plant, it is necessary to examine quality of imported fuel periodically. Moreover, in case that doubts about quality of fuel inconsistent with provision TCVN, examination shall be carried out immediately.

Imported fuel sampling shall be conducted in accordance with existing standards and regulations. In case that the data are not matched with what in supply contract, supplier shall be invited to check it and take minutes and deducting or adding fuel volume shall be done based on the supply contract.

Moreover, safety operation condition of combustion facility and appropriate environmental operation condition of environmental facility, for example, fuel supply volume and combustion air volume shall be adjusted whenever fuel is changed.

Article 104. Check and calibration of measuring device

Measuring devices for identification of fuel volume shall be checked and calibrated as scheduled approved by the Owner. In addition, these devices shall be verified by Directorate for Standards and Quality.

Article 105. Fuel transportation by railway

Fuel transportation by railway shall be in line with “Regulations on constant transportation, tracks between power plant and neighboring stations” set up for each power plant under the guidelines of railway.

Article 106. Railway facilities

Building and equipment for railway station, signal and telecommunication system and train under power plant management shall be kept in good conditions and repaired in line with requirements of railway.

Article 107. Maintenance of fuel facilities

Checking devices, automatic controlling equipment, remote control, protection equipment and interlock of loading equipment, fuel feeding devices, and fluid and gas fuel system shall be kept in good condition and checked periodically.

Article 108. Unloading safety

When using unloading device and other equipment, it is necessary to abide by the regulations of railway for the safety of car.

Article 109. Operation of coal stock yard facilities

Equipment in coal stock yard shall be in readiness for safety operation and ensured to operate at rated capacity. The removal and cleaning of dropped coal powder shall be conducted to eliminate a fire disaster.

Article 110. Crane and coal conveyor safety

It is prohibited from operating crane and coal conveyor when detecting breakdown of brake, claw, and switch and deviation reducer.

Article 111. Monitoring of temperature of coal stock yard

Temperature of coal stockpiles shall be monitored on a regular basis. When the temperature exceeds an acceptable value stockpiles must be leveled by bulldozer and sprinkled with water. In addition, if the temperature continues to rise, the pile shall be replaced to eliminate a fire disaster by reclaimer.

Article 112. Operation of coal feeding system

The coal feeding system shall be operated by being cautious of overloads when operating a coal conveyor and tripper after an announcement. The source investigation of trouble shall be conducted prior to stand-by operation as long as there is sufficient fuel to operate the main combustor.

Article 113. Control of coal feeding system

(moved to Design Technical Regulation or guideline)

Article 114. Safety of operation of coal feeding system

It is prohibited from operating equipment of coal feeding system when protection devices such as fence system and brakes are not available or broken.

Coal feeding system shall be stopped and inspected when noise and high temperature of each equipment of this system are found at daily patrol or daily inspection.

Article 115. Protection equipment of coal feeding system

Dust in rooms of coal feeding system shall be checked in line with regulations on safety and firefighting of coal feeding system in power plant. When air cleaner operates, it shall satisfy the standards on cleaning and precipitating dust.

Article 116. Chute of heavy oil tank

Chute shall be kept in good condition and clean. After discharge from the heavy oil tanks, heavy oil in chute must be discharged and sealed.

Chutes, hydraulic valves, dampers and filters of heavy oil basins shall be cleaned when it is necessary.

Article 117. Temperature of heavy oil

Heavy oil in basin shall be heated enough to make oil pumps work well. In basins and reservoirs of heavy oil storage, it is prohibited from heating heavy oil more than limiting temperature.

Article 118. Fluid fuel feeding

Fluid fuel system shall ensure to supply uninterruptedly the fuel which has been filtered and heated, while satisfying demand of boiler and gas turbine with necessary pressure and viscosity for normal operation of fuel burners.

Article 119. Operation of oil system

The oil system shall be operated by being cautious of oil leakage to prevent fire disaster and environmental pollution. When finding oil leakage form oil system, it shall be stopped immediately and repair work shall be conducted. Standby oil pumps, heaters and filters shall be always checked by daily patrol.

Article 120. Repair of pressure pipe

When a long term suspension is planned after halt of the main combustion equipment and using fire for periodic inspection and maintenance work, fuel shall be purged immediately and completely.

Article 121. Safety of fuel oil reservoir

Oil leakage of each oil reservoir shall be checked at daily patrol. Moreover, firefighting system shall be always kept in good condition.

Article 122. Safety of gas supply system

Operation of gas supply system of power plant shall be in line with regulations on the safety in gas system of Boiler Inspection Board.

Article 123. Safety of gas pipeline

Pressure in gas pipeline of boiler shall not be over values mentioned in regulations of power plant.

At intervals decided by the Owner, operation of pressure signal from maximum to minimum in gas pipeline of boiler downstream of automatic pressure regulator shall be checked.

Article 124. Gas charge

When supplying the fuel gas to pipeline, air inside pipeline shall be exhausted. The end of purge shall be determined by analytical methods or burn samples in which oxygen concentration in the fuel gas does not exceed 1%, while stable flame and does not cause explosion.

When purging a mixture of air and gas, exhaustion of gas pipeline shall be carried out at places where the mixture is not entered into house and does not cause a fire by any sources of fire. Discharging gas from gas pipeline shall be purged by air until gas is removed in the pipeline. The end of purge is determined by analytical methods in which the residual gas concentration in the air does not exceed 1%.

Article 125. Check of underground gas pipeline

As scheduled and method decided by the Owner, check shall be carried out throughout underground gas pipeline in area under management of power plant.

Article 126. Safety of operation in underground structure

For checking gas accumulation in basements, manholes and other underground structure, gas analyzer shall be used.

It is prohibited from entering into manholes, pits and other underground structure to take air sample.

Analyzing air in basements of building can be carried out at basements by safe analyzer, type of explosion prevention. In case that such analyzer is not available, air sample shall be taken out for analyzing.

When checking basements of building and manholes, pits and other underground structure, it is prohibited from smoking and using fire.

Article 127. Detection of gas leakage

When detecting gas leakage, operator shall immediately isolate area to ensure safety. It is necessary to find the cause of a gas leakage immediately and it is prohibited from using fire as a measure until gas leakage is detected.

Article 128. Investigation of gas leakage

After detecting gas leakage in accordance with the appropriate method, the repair work shall be conducted after gas isolation and purge depending on the source of the leakage to prevent fire disaster and toxic gas.

Article 128-a1. Storage tank

When operating liquefied gas system, operator shall pay attention to gas pressure, liquefied gas level etc. in storage tank. When detecting defect in gas pressure, liquefied gas level etc. in storage tank, operator shall shut off inflow and outflow of gas or liquefied gas immediately

Article 128-a2. Vaporizer

When operating vaporizer of liquefied gas system, operator shall pay attention to gas pressure, gas temperature, liquid level of liquefied gas etc. Moreover, when detecting extraordinary low pressure or gas temperature etc., operator shall shut off inflow and outflow of gas or liquefied gas immediately and stop vaporizer safely.

Article 128-a3. Compressor

When operating compressor of liquefied gas system, operator shall pay attention to outlet gas pressure, lubricant oil pressure etc. Moreover, when detecting the following faults, operator shall stop compressor safely.

1. Extraordinary low of outlet lubricant oil pressure (compressor with force-feed lubrication oil system)
2. Extraordinary low of seal oil supply pressure (turbo type compressor with seal oil)
3. Extraordinary low of inlet gas pressure (to prevent negative pressure of tank and inflow of air in liquefied gas system)

Article 128-a4. Liquefied gas pump

When operating liquefied gas pump, operator shall pay attention to outlet pressure, vibration, rate of flow and current of motor. Moreover, when detecting the following faults, operator shall stop liquefied gas pump safely.

1. Extraordinary low or high of outlet pressure
2. Extraordinary vibration
3. Extraordinary discharge rate of flow
4. Extraordinary current of motor And others

Article 129. Safety of gas supply in blast furnace and coke-burning boiler

Gas supply and burning in blast furnace and coke-burning boiler in power plant shall be in line with safety regulations on gas system of metallurgy plant.

Article 130. Determination characteristics of gas burning

Operating characteristics when supplying and burning gas in boiler, industrial emission (Inclusive of SO_2), and sulfur in natural gas (inclusive of mercaptan) shall be identified in design and regulations of power plant.

Chapter 3 Pulverized Coal Processing

Article 131. General Provision

Processing equipment for pulverized coal shall operate for the consecutive supply of pulverized coal with required fineness and moisture to burner, and corresponding amount of boiler’s demand.

Processing mode of pulverized coal processing system shall be in line with operation flow diagram set up based on technical specifications of manufacturer and experiments on coal processing equipment and combustion chamber's equipment. In every operating mode of pulverized coal system, possibility of pulverized coal remained in components of system shall be removed.

Article 132. *(moved to Design Technical Regulation or guideline)*

Article 133. Starting up system

After being repaired and stopped over 72 hours, before starting pulverized coal processing equipment, its measuring instruments, remote control system, protection equipment, signaling system, automatic and interlock system shall be checked for good condition. It is prohibited from starting the pulverized coal processing equipment in case that interlock and protection systems are broken.

After being assembled or rehabilitated, before starting equipment, it is necessary to lift covers and manholes to observe and clean up remaining pulverized coal. Such observation and cleaning shall be carried out until all remaining pulverized coal is removed. Similarly, covers and manholes shall not be opened at next start up.

Article 134. Check during operation

When operating pulverized coal processing system, it is necessary to check:

1. Feeding of fuels for pulverizer
2. Amount of raw coal and pulverized coal shall not be lower or higher than amount stipulated in regulations of power plant.
3. Temperature of pulverized coal in the system must not be over the stipulated limit;
4. Heat insulation and tightness of all parts of equipment. Holes which cause the air and pulverized leakage must be sealed immediately.
5. Clogging of a coal bunker, pulverized coal bunker and mixing bunker

Article 135. Adjustment pulverized coal system

After starting pulverized coal processing equipment, which has just assembled, rehabilitated or overhauled, it is necessary to take a sample of pulverized coal and measure their specifications in order to set up or revise operating mode scheme of the system.

Article 136. Pulverized coal processing system with heater

Operation of pulverized coal processing system with air heater and gas heater shall be in line with regulations of power plant and instructions of manufacturer. Power plant's regulations shall cover measures on explosion-resistance safety of pulverized coal processing system.

Article 137. Purge of pulverized coal system

When stopping system longer than stipulated time and before having boiler overhaul, it is necessary to exhaust coal dust from the system.

It is prohibited from bringing coal to combustion chamber when boiler is stopped. Pulverized coal shall be discharged from the system before stopping coal pulverizer and other equipment for processing coal.

Article 138. Safety on welding

Welding carried out in pulverized coal processing plant shall be allowable only when equipment is offline and pulverized coal free. Moreover, it is required to remove coal and/or pulverized coal, to protect conveyor belts, cables and oil equipment thoroughly in order to eliminate an explosion and fire disaster.

Chapter 4 Boiler and its Auxiliary

Article 139. General provision

When operating a boiler and its auxiliary, it is necessary to pay attention to the following items:

1. Main equipment and auxiliary facilities operate safely;
2. To come up to rated steam value, steam and water quality;
3. To be in economical operating mode without unstable burning and be identified based on experiments and procedures of manufacturer.
4. To maintain demand range that is determined for each type of boiler and fuel.

Article 140. Cleaning of boiler

After construction before being put in operation the boilers should be cleaned.

After overhaul the cleaning should be carried out if necessary.

Right after washing off, measures for protecting washed surfaces shall be carried out to keep such surfaces from corrosion.

Article 141. Check of protection equipment before starting up boilers

As for boilers which are repaired or are in long standby (over 72 hours), before being put in operation, it is necessary to check condition of protection equipment and interlock.

In case that damage is detected, it shall be repaired in a timely manner. It is prohibited from starting up boiler in case that tripping circuit of boiler is broken.

Article 142. Boiler feed water

Water to be fed to boiler before starting up shall be treated one. Detailed standards for feeding boiler with water shall be stipulated in regulations of power plant.

Article 143. Operation of fan

Before starting up and after stopping boiler, it is necessary to operate induced draft fan (flue blower) and forced draft fan during the time that is decided by the Owner according to manufacturer's instruction.

Article 144. Water level on steam drum at start up

From start-up of boiler, water level in steam drum shall be monitored closely.
Upper level gauge (water level) shall be cleared when necessary.
During starting up boiler, it is necessary to check and calibrate water level indicator in control room so that the level is matched with level of level gauge.

Article 145. Regulation about start-up

Duration of starting up boiler from various heat conditions shall be in line with start-up scheme, which is determined based on experiments on start-up mode and procedures of manufacturer.

Article 146. Checking when start-up

During starting up boiler after overhaul or minor repair (at least once a year), expansion points of steam drum and header, temperature status of steam drum, super heater metal temperature, typical boiler metal temperature and load up rate shall be monitored if it is provided. Speed of increase and decrease of steam drum's temperature, temperature difference between upper and lower of steam drum should be stipulated in regulations of power plant.

Article 147. Connection to main line

Boiler just started up shall be connected to main line after the connector is heated, remaining water is discharged, and boiler pressure almost reaches pressure of main line.

Article 148. Operation mode

Operating mode shall be in line with mode set up based on experiments and tests. Modes need to be revised in case that fuel quality changes or boiler is renovated.

Article 149. Check of temperature

When operating boiler, it is necessary to monitor heating status to maintain allowable steam temperature at each level and current of primary super-heater and re-heater.

Article 150. Heating surface

Heating surface of boiler shall be kept clean by maintaining optimal burning and using cleaning equipment (dust blower, ball-cleaner, etc). These equipment and their remote control and automatic devices shall be in readiness for operation if need be.

Article 151. Technical requirement of fan system

Discharge and pressure of induced draft fan and forced draft fan shall satisfy boiler’s requirements. As for the boilers with either two induced draft fan or two forced draft fan, when one of two stops, gas or air shall not be leaked through the stopped fan so as to regularly distribute air for burners.

Article 152. Gas emission

For boilers burning any type of fuel, gas emission shall meet environmental standard at any mode during the boiler operation.

Article 153. Operation of heavy oil burner

It is prohibited from operating heavy oil burner without feeding hot air.

Diagram for conduct steam to purge mechanical nozzles and heavy oil pipeline within the boiler, must be arranged so that not to fall into steam pipeline.

Article 154. Thermal insulation

Abnormal temperature rises of thermal insulation’s surface and heat leaks shall be detected by daily patrol.

Article 155. Commissioning after change of fuel

It is necessary to implement the boiler commissioning when it is put in operation after the change of fuel type as stipulated for in Article 148 of the "Technical Regulation Vol. 4."

Article 156. Wear resistance measures

When the boiler is put on standby or repaired, wear resistance measures should be applied according to need. Methods detailed shall be decided by the Owner

Article 157. Cooling of steam drum

When the boiler just stops operating, feeding steam drum with water and discharging water shall not be done at the same time to push up the coolness of steam drum in case that temperature of water in steam drum can't be controlled.

Article 158. Water discharge for boiler

After stopping gravity circulation boiler, water discharge shall be only carried out when boiler pressure is equal to ambient pressure and water temperature is not over $80^{o}C$.

Article 159. Monitoring when stopping boiler

When the boiler has been stopped, the operator shall watch over until its pressure comes to ambient pressure and power supply to boiler is disconnected.

Article 160. Emergency stop of boiler

The boiler shall be stopped urgently by protecting equipment or operator.

1. Water level in steam drum is higher or lower than standard, or all water indicators and signal are broken;
2. Water levels in steam drum experience rapid decrease although water is still being fed;
3. All boiler feeding pumps are broken,
4. Pressure in steam main piping is over allowable limitation;
5. Overhaul of the safety valve or other safety devices, repair valve that is not working;
6. Steam pipelines related to the boiler are broken or cracks, blisters, defective weld in main parts of the boiler (steam drum, collector, steam pipes, water pipe down), in the main steam pipeline, feed water line are occurred;
7. Flame in the combustion chamber is lost;
8. Adjusted gas or oil pressure reduces the permitted level (Apply for gas or oil fired furnace);
9. At the same time gas and heavy oil pressure (gas mixture) after control valve reduces below the allowable limitation of the plant procedure;
10. All induced draft fans and forced draft fans stop, or furnace draft is outside the stipulated range;
11. Explosion in combustion chamber, explosion or fire of fuel deposit remained in flue or dust precipitators, incandescence of steel structure of the boiler's body, or other damages threaten operator's life;
12. Fires threaten operator's life and equipment, remote controlling circuit which can touch boiler's protection circuit;
13. Remote control, automatic equipment, testers and meters are broken down;
14. With gas-fired boilers, apart from above-mentioned requirements, technical standards on safe gas system are violated.

Article 161. Stop of boiler

The operator shall stop boiler if the following cases have a large impact on operation of boiler,

1. Detecting leak-out on heat tube's surface, on steam mains, headers, water feeders as well as flange valves are blown off or leaked out;
2. Metal temperature and heating surface is hotter than standard, and after changing operating mode, the temperature does not come up to allowable values;
3. Remote water level indicators are broken;
4. Feeding water quality is suddenly bad in comparison with standard;
5. Dust precipitators of coal-fired boiler are broken;
6. Some protection equipment, automatic and remote control equipment and indicators, meters are broken;

In these cases, off-line duration of the boiler shall be decided by the Owner.

Chapter 5 Steam Turbine and its Auxiliary

Article 162. General provision

When operating steam turbine, it is necessary to pay attention to the following items:

1. Safe operation of main equipment and auxiliaries;
2. Availability of rated load at heating demand;

Article 163. Turbine control

Turbine control system shall satisfy the following requirements:

1. Maintaining rated power demand and heat demand steadily;
2. Keep turbine stably in no-load condition with rated revolutions of rotor at rated steam conditions and start-up one.
3. Ensuring well-balanced change of power and heat demand when operating turbine’s adjusting structure.
4. When suddenly shedding load to zero (including disconnection of generator from power network) at maximum steam flow at rated steam condition(in turbine), revolutions of turbine’s rotor must be kept lower than adjusted limit (lower revolutions of turbine’s rotor exceeding)
5. Regularity of adjusting rotary frequency of turbine (at rated steam condition) must be within the design value. As for back-pressure turbine and combine cycles it also must be within the design value.
6. Insensitiveness (sluggishness) at rotary frequency must not exceed the design value.
7. Partial irregularity of rotary frequency must not be lower than the design value at each load demand;
8. Irregularity in adjustment of extraction steam pressure and back-pressure must satisfy manufacturer's instruction so as not to activate safety valves.
9. Insensitiveness in adjustment of extraction steam pressure and back-pressure must not be higher than the design value.

Article 164. Emergency governor

Emergency governor shall be calibrated to operate when rotary frequency of turbine exceeds 10 - 12% comparing to rated one, or reaches specifications stipulated by manufacturer.

When emergency governor is activated, main steam stop valve, reheat steam stop valve, regulating valve and extraction valve shall close automatically.

Article 165. Steam stop valve and regulating valve

Stop valve and regulating valves of main steam and reheat steam can be opened at rated steam pressure at inlet of turbine and vacuum of condenser. Turbine's rotor shall not be revolved when these valves are closed.

In case that all stop valves are closed and regulating valve are opened and vise versa, rotary frequency of turbine's rotor shall not be over value of manufacturer.

Article 166. Check of valve

It is necessary to check the smooth closing and opening of stop valve and regulating valves of main steam and reheat steam, extraction non-return valve at operating (open-close) test.

Also, behavior of power plant shall require attention at operating (open-close) test.

Article 167. Check of operation of extraction non-return valve

It is necessary to check the operation of all non-return extraction valves before each start-up and stop of turbine, as well as during turbine's normal operation according to need.

It is prohibited from operating turbine's steam extract slot when corresponding non-return extraction valve is broken.

Movement of non-return extraction valves shall require attention at operating (open-close) test.

Article 168. Turbine oil feeding system

Oil feeding system of turbine shall be ensured:

1. Reliable operation of turbine in every operating mode;
2. Safe firefighting;
3. Ability to maintain oil quality corresponding to criteria;
4. Ability to prevent oil leakage into cooling water system.

Article 169. Check of backup devices

In operation, it is necessary to check auxiliary and emergency oil pumps, and their automatic start-up devices of such pumps at necessary frequency, as well as before starting up and stopping turbine.

Article 170. Operation of heat exchanger system

In operation, heat exchanger system shall be ensured:

1. Reliability of heating exchanger in every operating mode;
2. Rated feeding water temperature;
3. To keep rated temperature difference in each heating exchanger.

It is necessary to check temperature in heating exchanger and heat recovery system before and after having turbine engine overhauled, after having heater repaired and as scheduled decided by the Owner.

Article 171. High-pressure heater

It is prohibited from operating high-pressure heater when protection and adjusting equipment is not available or broken.

In case that high-pressure heater group share emergency exist, it is allowed to operate that high-pressure heater group when one of the protecting and adjusting equipment for high-pressure heater's drain line is not available or broken, when disconnecting line of any high-pressure heater.

Article 172. Check before starting up

Before starting up turbine (after repair or from shutdown condition), it is necessary to check the perfection and readiness of main equipment and auxiliary devices, protection equipment, remote control interlock, testing and measuring devices and means of telecommunication. All detected damages and faults should be fixed as soon as possible.

When starting up turbine from any condition, operation of protection equipment and interlock shall be checked as rules in regulations of power plant.

Article 173. Prohibition of steam turbine start-up

It is prohibited from starting up steam turbine in case that :

1. Parameters of heat and mechanical condition of turbine exceed limitation;
2. One of protection equipment for stopping turbine is broken;
3. Faults of speed governing system cause turbine's over-speed with main steam and reheat steam.
4. One of oil pumps or interlock of oil pump is broken;
5. Oil quality does not come up to standard oil quality for operation, oil temperature is outside the stipulated range;

Article 174. Check of turbine bearings, generators

Vibration of turbine bearings, generators and exciters shall not exceed the values decided by the manufacturer:

Article 175. Emergency stop of turbine

Turbine shall be stopped immediately by closing main stop valve and disconnecting generators by disconnector in the following cases:

1. Rotor's frequency speed exceeds stipulated value which automatic speed reduction gear shall operate;
2. Shaft vibration of turbine exceeds allowable value.

3. Relative expansion of the turbine rotor exceeds allowable values;
4. Lubricant pressure in lubricating system decreases lower than allowable limitation;
5. Oil level in oil tank is lower than allowable limitation;
6. Oil temperature of bearing, thrust bearing in the generator exceeds allowable limitation,
7. Oil burst into flames in turbine engine and no capability to stamp fire out promptly with existing firefighting equipment;
8. Oil pressure difference of sealing system of hydrogen cooling generator decreases lower than allowable limitation;
9. Oil level in vacuum reducer of cooling system (for hydro engine) decreases lower than allowable limitation;
10. All oil pumps of hydro system for cooling engine are stopped;
11. Generator is stopped due to internal fault or malfunction of generator-relating facilities;
12. Vacuum in condenser decreases lower than allowable limitation;
13. Final blades of back-pressure turbine are overloaded;
14. The safety membrane of the exit cylinder low pressure in turbine is punctured;
15. Vigorous vibration arises suddenly in turbine energy;
16. Metal noises and unusual noises occurred inside turbine;
17. Sparks or smoke come from bearings and spindle sealing devices of turbine and generator;
18. Temperature of intake steam or reheated steam decreases lower than allowable limitation;
19. Hydraulic shock arises in intake steam pipe or inside turbine;
20. Fissures of oil tubes, main steam pipe, extraction steam pipe, reheat steam pipe, major drain pipe, feed water pipe, header, welded seams or flanges, valves and casing are detected;
21. Oil pressure of adjusting system decreases lower than allowable limitation;
22. Cooling water for generator stator is lost;

Stop of generator with vacuum destruction shall be specified in regulations of power plant, which are in line with manufacturer’s instructions.

Power plant’s regulations shall cover specific guidelines for the cases when checked values are higher than allowable limitation of engine.

Article 176. Stop of turbine

Reducing output or stop of turbine shall be conducted at the Owner’s judgment in consideration of status of the equipment in cases that, (After notice to the National Load Dispatch Center).

1. Stop valve of main steam or reheat steam is stuck;
2. Governing valve for steam coming to turbine is stuck or valve pin is broken;

3. Faults in speed governor are occurred;
4. Faults on the auxiliaries, diagram, tubes of boiler and so on occur, and such faults cannot be fixed while turbine is in operation;
5. Faults in protection equipment which operates to stop equipment are detected;
6. Leakage of oil tubes, main steam pipe, extraction steam pipe, reheat steam pipe, major drain pipe, feed water pipe, header, welded seams or flanges, valves and casing are detected;

Article 177. Stop time of turbine

For each turbine to determine the rotation inertia time of the rotor when stops in a vacuum are normal and when stops destroy the vacuum. If you see that time is reduced, the cause must be determined and how to fix it. Rotation inertia time must be checked in time to stop all turbine units.

Article 178. Operation mode of turbine

The operation of turbines with a capacity given in the chart and in the modes have not been included in technical requirements while providing equipment (Synchronous Compensator, heat water in condenser...) is only allowed according to the manufacturer's instructions

Article 179. Corrosion protection

When putting turbine in long standby, it is necessary to apply rust-resistance measures inside turbine in accordance with existing regulation of maintenance of thermo equipment.

Article 180. Cooling water system

Cooling water for power plant shall be in uninterruptedly supplied, and adjustment of heating status shall be ensured to maintain the best vacuum condition to keep condenser and circulating tubes from dirtiness.

Article 181. Operation of cooling tower

When operating cooling tower and spray pond it is necessary to ensure:

1. Optimal operating mode to reach best vacuum condition shall be kept;
2. Cooling efficiency shall satisfy regulation characteristics;
3. Water distribution system shall be checked and washed, and screening surface pipe condenser shall be checked and pipe shall be washed when it is necessary.

Chapter 6 Unit-type of Thermal Power Plants

Article 182. General provision

Operating unit-type shall be ensured reliable and long-term

Article 183. Start-up

It is prohibited from starting up unit in case that,

1. Protection equipment to stop unit's equipment is broken;
2. Remote control, which acts on adjusting components, and emergency valve are broken;
3. When having conditions on prohibiting to start up main equipment and accessories;
4. Demineralizer of the unit has not been in readiness yet;
5. Bracket and frame of pipe are broken;

Article 184. Keeping operation units

It is prohibited from maintaining unit's operation in case that demand of turbine-generator is reduced to self-station demand or to no-load value if fast cut back system is not equipped with boiler.

Chapter 7 Gas Turbine and its Auxiliary

Article 185. General provision

When operating gas turbine, it is necessary to pay attention to the following items:

1. Stable operation of main equipment and auxiliary devices;
2. Possibility to operate at rated parameters;
3. Without air leakage or fuel, lubricating oil and water leakage.

Article 186. Regulating system

Regulating system of gas turbine shall satisfy the following requirements:

1. Assigned power demand shall be maintained stably;
2. Turbine in operation at no-load mode shall be kept when rotary frequency reaches rated value;
3. It shall be ensured the safe operation of gas turbine when starting up and stopping equipment in emergency;
4. It shall be ensured the smooth operation (no vibration) of gas turbine when load changes irregularly;
5. The rotor's rotary frequency from emergency governor shall be kept when shedding maximum load to zero (for independent gas turbine, shedding load to house load of power plant);
6. Turbine inlet gas temperature as requirement shall be kept, so as not to increase to the limitation which causes the operation of protection equipment.
7. Insensitiveness of gas temperature controlling system shall not be higher than the designed value.

Article 187. Monitoring of temperature rise

The change in temperature shall be monitored carefully during starting-up and operation to eliminate rapid temperature impulse

Article 188. Protection equipment for gas temperature

Protection equipment, which keeps gas temperature from exceeding limitation, shall be calibrated for being able to operate at the stipulated temperatures of manufacturer when it's necessary.

Article 189. Emergency governor

Emergency governor shall be calibrated to operate when rotation speed increases 10 - 12% against rated value or reaches to stipulated values of the manufacturer.

Article 190. Protection from dust, waste of inlet chamber the gas turbine

During operation of gas turbine, measures on minimizing air dust attacking gas turbine’s inlet (plant grass on vacant spaces, spread asphalt on the roads, air-filters, spray water, etc.) shall be carried out, and keep wind boxes from attack of wastes.

Article 191. Air filter

It is necessary to check condition of air filter while operation. It is necessary to prevent oil or other materials from dropping inside air intake of gas turbine through air filter. It is necessary to check and clean air filter, clean duct and keep them from dust and soot, and air filter shall be checked and cleaned when it is necessary.

Article 192. Protection of air filter

When the differential pressure of a gas turbine inlet filter is too high, it is required to stop the gas turbine safely and replace the filter or to clean up under a low load.

Article 193. Regulating valve

Stop valve and fuel regulating valve of gas turbine shall be closed tight. Fuel shall not be leaked out through valves. Valves shall be checked before each startup. Tightness of valves shall be checked at interval set by the Owner.

Article 194. Valve on the oil system

In the chart of the insertion shaft of the generator to clamp at the position operation of valves, the handwheel of the valves fits on the oil pipeline before and after the oil cooler, on the suction head and discharge end of backup oil pump and accidents on oil exhaust from oil tank of gas turbine, before and after filters can be eliminated.

Article 195. Check before start-up turbine

After restarting gas turbine after refurbishment or standby of more than 72 hours, it is necessary to check the perfection and readiness of protection equipment, interlock of auxiliaries and lubricating system, auxiliary and emergency oil pump. Detected faults must be overcome.

Article 196. Prohibition of start up

It is prohibited from starting up the gas turbine in case that:

1. Gas turbine is broken or stopped by any actions of protection equipment, but the cause is not specified and recovered yet;
2. Shortcomings of adjusting system, accordingly, gas temperature increases over allowable limitation or turbine speeds up;
3. One of oil pumps or their interlock system are broken;
4. Fuel or oil quality does not come up to standard, and fuel pressure (or oil pressure) is lower or higher stipulated limitation;
5. Mechanical and thermal parameters of gas turbine exceed allowable limitation.

Article 197. Purge of gas duct

Before burning fuel in combustion chamber, gas duct of gas turbine shall be ventilated when rotating rotor by facility for start-up. Ventilation time shall be stipulated in power plant's regulations. In case that gas turbine fails to be started up and is re-started, it is prohibited from re-burning fuel without ventilating roughly entire system.

Article 198. Stop of start up

Startup shall be stopped immediately by operation of protection equipment or operator in the following cases:

1. Gas temperature at inlet of gas turbine increases over allowable limitation against startup diagram;
2. Noises of metal when stroke together (grinding, click) and generator becomes more vibrant;
3. Starter's load exceeds allowable limitation;
4. Axial rotating frequency reduces less than stipulated value after removing startup equipment;
5. Instability in gas turbine's air compressor is occurred;
6. Outlet air pressure of air compressor goes under allowable limitation.

Article 199. Emergency stop

Gas turbine shall be stopped urgently by operation of protection equipment in the following cases:

1. Turbine's inlet gas temperature exceeds allowable limitation;
2. Rotary frequency of rotor exceeds allowable limitation;
3. Fissures and bursts occurred in grease duct and high-pressure fuel manifold;
4. Shaft vibration exceeds allowable value, relative movement of compressor and turbine rotor exceed allowable value;

5. Lubricating oil pressure in lubricating system or oil level in tank decrease lower than allowable limitation concurrent oil temperature exit bearing or bearing temperature exceeds allowable value;
   decreases lower than allowable limitation;
6. Noises of metal when stroked together (grinding, click) and unusual noises come from inside the gas turbine and its' parts;
7. Strong vibration suddenly appears in turbo-generator;
8. Sparks or smoke rise from bearings, washers of gas turbine or generator;
9. Grease or fuel burst into flames without ability to extinguish immediately with existing firefighting equipment;
10. Bang comes from combustion chamber or gas duct;
11. Air compressor approaches an unstable condition or almost reaches unallowable values of unstable limitation;
12. Combustion instability such as flame lost and abnormal pressure of gas or fluid under allowable limitation is occurred;
13. Power cut-off is occurred due to inside failures of generator;
14. Malfunction of electric system such as loss of power for regulating, automatic equipment and measurers, indicators is occurred;
15. Together with disconnection of gas turbine, it is necessary to disconnect generator by operation of protection equipment or operators.

Article 200. Load reduction of gas turbine

Reducing output or stop of gas turbine shall be conducted at the Owner's judgment in consideration of status of the equipment in cases that,

1. Stop valve, regulating valve and compressor intake pressure reducing valve are stuck;
2. Surface temperature of turbine body, combustion chamber, and exhaust duct exceeds allowable limitation and change of operating mode cannot reduce it;
3. Inlet air temperature of high-pressure air compressor exceeds allowable limitation, as well as in case that normal water feeding mode is violated;
4. When some online protection devices, indicators or meters are broken;

Article 201. Fire extinction of soot

When soot in heater or economizer of water system burst into flames and such situation does not cause dangerous change of parameters, such equipment shall be kept in operation to cool heat exchange surface. When soot burst into flames in cold gas turbine, it is necessary to operate extinguishers.

Article 202. Ventilation system

After stopping gas turbine, it is necessary to ventilate efficiently entire system and give ventilations on fuel header and burner with air or inert gas. When completing ventilation, damper at intake or gas exhaust duct shall be closed. Time and period for ventilation and rotation of rotor when cooling gas turbine shall be stipulated clearly in power plant's regulations.

Article 203. Rules on technical maintenance

(moved to paragraph 8 of Article 164 & 165 of Technical Regulation Vol.5)

Article 204. Observation operation

Based on observations and indicators on meter measurement during operation must carry out analysis regularly

1. Corresponding gas turbine power more than specified;
2. The level of contamination and backup stability of the compressor;
3. The effect of heat transfer;
4. The uneven temperature measured in the turbine;
5. The pressure of fuel and air (gas fumes) in the characteristics;
6. Vibration of turbines, compressors, generators and stimulation. Checking of the limited number of deviation parameters against passport machine must not exceed the value given by the manufacturer.

Article 205. Check of governor

(moved to paragraph 9 of Article 164 & 165of Technical Regulation Vol.5.)

Article 206. Check of gas temperature

(moved to paragraph 10 of Article 164 & 165of Technical Regulation Vol.5.)

Article 207. Check of gas turbine control system at load dump

Check of operation of gas turbine control system by shedding load suddenly through disconnecting generator from power grid shall be carried out when it's necessary.

1. Checking and taking over gas turbine for putting in operation after assembly;
2. Appearing changes of dynamic characteristics of gas turbine, or changes of static and dynamic characteristics of regulating system after innovation;
3. When detecting changes of static and dynamic characteristics of regulating system during operation or after refurbishment (after fixing the detected shortcomings).

Article 208. Check of vibration

Vibration of turbine, air compressor, generator and exciter shall not be exceeding the values based on specifications of manufacturer.

Article 209. Check interval for gas turbine's overhaul

(moved to paragraph (3) Article 159 of Technical Regulation Vol.5.)

Chapter 8 Diesel Generator

Article 210. General provision

Appropriate measures for the diesel generators shall be taken to prevent damage to the components.

Article 211. Operating conditions of diesel generator

Components of the diesel generator such as the diesel engine, fuel supply system, lubrication system, cooling system, generator, etc. shall be inspected so that there is no risk of a hindrance to operation of the diesel generator due to their damage, malfunction, etc.

Article 212. Control system

It shall be confirmed for control system of the diesel generator that there is no risk of a hindrance to its operation due to malfunction, etc.

Article 213. Operation after overhaul

The diesel generator shall be carefully inspected before the operation after overhaul so that there is no risk of a hindrance to its operation.

Article 214. Safety of diesel generator start-up

It shall be confirmed for the diesel generator that there is no risk of a hindrance to its starting up due to lower compressed air pressure or lower voltage of storage battery, etc.

Article 215. Check of vibration

The diesel generator shall not be operated under conditions which exceed the allowable vibration specified by the manufacturer.

Article 216. Check of pipeline system

It shall be confirmed for pipeline system of the diesel generator that there is no risk of a hindrance to the proper operation of the diesel generator due to leaks of cooling water, lubricating oil, exhaust gas and compressed air, etc.

Chapter 9 Automation and Thermo-measuring Equipment

Article 217. General provision

Conditions of all automatic equipment and instruments shall be checked to ensure their reliable operation before their operation.

The control system of power plant shall be operated stably ensuring reliability.

Article 218. Standby power supply

Automatic thermo-measuring equipment shall be equipped with standby power supply with automatic and manual switchgear according to need.

Article 219. Insulation resistance of power and instrumentation cables

Insulation resistance of power and instrumentation cables shall be measured properly to avoid a fault due to poor insulation condition.

Article 220. Climatic conditions where installation

(moved to Article 244 paragraph 2 of technical regulation Vol.2.)

Article 221. Inspection measuring equipment

(moved to Article 174—a1 of technical regulation Vol.5.)

Article 222. Working mode of protection, measurement system

Protectors, which have been in operation, shall operate during the operation of main equipment. It is prohibited from disconnecting protectors, which are in smooth operation, from the operation.

Protectors for online equipment shall not be disconnected from the operation except for cases that safety is secured.

It is prohibited from repairing or calibrating online protecting circuit.

Article 223. Information archive

All cases for operation of protector as well as the cases that protector does not operate over set value shall be listed and analyzed.

Chapter 10 Water Treatment and Hydration

Article 224. General provision

Water quality management of power plant shall be carried out strictly to operate main thermo-equipment and auxiliaries and eliminate troubles.

Article 225. Water treatment

Water treatment modes in operation of power plant's equipment shall be appropriately controlled and checked.

Article 226. Corrosion protection

(moved to Design Technical Regulation or guideline.)

Article 227. Safety for chemical agent

Equipment, devices and vehicles shall be safe for loading, storing and transporting caustic soda, ammonia, hydrazine, chlorine, lime chloride, strong acids, other corrosive chemicals and their solution in technological process. It is necessary to strictly abide by safety technical rules when using chemicals and the above-mentioned chemical solutions.

Article 228. Wastewater treatment

Power plant's wastewater, which contains alkali, acid, ammoniac, hydrazine, grease sludge and other noxious substances shall be treated before discharging them outside.

Article 229. Chemical analyses

Chemical analyses in power plant shall satisfy the following content:

1. Corrosive and residue condition of water treatment and thermo equipment shall be had thorough grasp on.
2. Quality of water, steam, remaining salt, chemicals, organic fuel, ash, slag, gas and oil shall be defined;
3. The gas infection of rooms, manholes, tunnels and other works shall be checked;
4. Discharge water quality shall be defined.

Article 230. Boiler water

Standards on quality of boiler water shall be stipulated based on thermo-chemical experiments and identification of allowable limitation of rated impurities (total salt content, silica acid content, etc) in various operating modes of boiler. Quality of such steam shall ensure the cleanness of boiler's heating surfaces, as well as keep metal from erosion and destruction.

Article 231. Discharge of boiler water

Continuous discharge of boiler shall be measured with flow meter.

Periodic discharge of boiler from bottom shall be carried out when starting up and stopping boiler, as well as during boiler's operation as schedule of power plant.

Chapter 11 Pipelines and Valves

Article 232. Inspection before operation

Pipelines and valves shall be examined carefully before being put in operation. After refurbishment or long offline period, the perfection of thermo insulation, thermal expansion indicator, fixed frames, brackets and sliding supports shall be checked.

Free thermal expansion ability of pipeline when being heated, conditions of water discharge valve, exhaust valve, safety valve and thermometers, pressure gauge and flowmeter shall be checked.

Article 233. Inspection in operation

When pipelines are operated under existing regulations, the following items shall be conducted at an appropriate time:

1. The thermal expansion by readings of indicators shall be checked. Pipelines must not be stuck and vibration must not be increased;
2. Metal conditions shall be monitored periodically and the shortcomings of welded seams shall be checked;
3. The tightness of valves and jointed flanges shall be observed;
4. The working temperature mode of metal in each startup and stop shall be checked.

Article 234. Safety of pipelines system

Pipelines layout and their operation shall be kept from the risk of damages on low-pressure lines when contacting high-pressure ones.

Article 235. *(moved to Article 167-a2 of Technical Regulation Vol.5.)*

Article 236. Check of thermal insulation

Abnormal temperature rises of thermal insulation surface and heat leaks shall be detected by daily patrol.

Article 237. *(moved to Design Technical Regulation or guideline)*

Chapter 12 Auxiliaries for Thermo-mechanical Section

Article 238. Confirmation before start-up

After repairing or stopping operation over period set by the Owner, status of protectors, automatic and safety equipment, valves and meters shall be checked before energizing auxiliaries for operation.

Article 239. Protection of auxiliaries

It is prohibited from energizing auxiliaries after any stop due to the fault of protectors to stop auxiliaries until the fault is removed.

Article 240. *(moved to Article 167-a2 of Technical Regulation Vol.5)*

Article 241. Pressure reducer and attemperator device

It is prohibited from operating pressure reducer and attemperator when safety valve at depressurized steam point is locked or broken.

Article 242. Check of vibration

Vibration of auxiliaries metered in bearings shall not exceed rated value in power plant's regulations.

Chapter 13 Environmental Protection Facilities

Article 242-a1 De-NOx and De-SOx equipment

Consistency of NOx and SOx in gas emission to atmosphere shall not exceed allowable values specified by Vietnam government.
It is prohibited from stopping De-NOx and De-SOx equipment in case that the gas emission doesn't meet the values without these equipments.

Article 242-a2 Monitoring of consistency of NOx and SOx

In power plants, it is necessary to strictly watch over the operating mode of De-NOx and De-SOx equipment so that gas emission meets environmental standards.

Article 243. Dust precipitator

Dust content in gas emission to atmosphere shall not exceed allowable calculated values for each power plant.

It is prohibited from stopping dust precipitator in case that the gas emission doesn't meet the values without the dust precipitator.

Article 244. Monitoring of dust precipitator

In power plants, it is necessary to strictly watch over the operating mode of the dust precipitator so that gas emission meets environmental standards. For the wet type dust precipitator, the exhaust temperature, pressure and waste water must be controlled

Article 245. Ash and slag disposal system

It shall be ensured during operation of ash and slag disposal system that:

1. To dispose of in a timely manner and continuously
2. To keep safety for equipment and works inside and outside of ash and slag disposal system;
3. To prevent water source, air and surrounding areas from being contaminated by ash and wastewater.

Article 246. Check of ash and slag disposal system

Meters and testers, protection equipment, interlocks and signals of wet type ash and slag disposal system and compressed air shall be kept in good condition and checked periodically.

Article 247. Ash pond

It is necessary to periodically check ash pond such as elevation of the surfaces and depth of settling area.

Article 248. Discharge of wastewater of ash and slag disposal system

Wet type ash and slag disposal system shall be a closed cycle system, and it is only allowed to discharge final clarification water from ash pond to rivers and common water ditches in cases permitted by law.

PART 6
ELECTRICAL EQUIPMENT OF POWER PLANTS AND GRIDS

Chapter 1 General Provision

Article 249. Documentation

The Owner of facilities shall keep and maintain following technical materials in each power plant, substation and maintenance office.

1. Minutes on granting land.
2. Minutes on set up foundation and profile of boring holes.
3. Minutes on check and acceptance of underground works.
4. Minutes (or records) on settlement of houses, works and foundations for installing equipment.
5. Check-list on testing equipment.
6. Completed work documents (testing record drawings, explanations, etc.).
7. Technical history of houses, works and equipment.
8. Plan for layout of firefighting equipment and means.
9. Records of engineering work
10. Results of Completion Inspection and Periodic Inspection

Chapter 2 Generator and Synchronous Compensator

Article 250. General provisions

Appropriate measures for the generator (synchronous compensator, hereinafter the same shall apply in this chapter.) and the auxiliary equipment shall be taken to prevent damage to the components, operational malfunction, etc.

Article 251. Exciter

It shall be confirmed for the excitation system that there is no risk of a hindrance to the function which supplies the proper level of dc current which is required for the apparent power, the terminal voltage, and the power factor to the generator field winding due to abnormal condition of collector rings and brushes, spark, etc.

Article 252. Seal oil standby equipment

When abnormal condition occurs in seal oil system of the hydrogen cooled generator, appropriate measures, such as automatic starting up of standby seal oil pump, shall be taken to prevent hydrogen leaks.

Article 253. Cooling system

No generator equipped with cooling system shall be operated without a cooling medium such as hydrogen and demineralized water to prevent deterioration or damage to the components.

Article 254. *(deleted)*

Article 255. Filter

Appropriate measures for the stator cooling water system, seal oil system, etc. shall be taken so that there is no risk of a hindrance to proper operation of the generator due to clogging of filters, reduced flow, etc.

Article 256. Hydrogen purity

Hydrogen purity in the generator shall not be lower than 85% to prevent danger of explosion.

Article 257. Seal oil pressure

Seal oil pressure of hydrogen cooled generator should be properly maintained higher than generator internal pressure in operation to prevent hydrogen leaks.

Article 258. *(deleted)*

Article 259. Overload operation

No generator shall be operated outside its short time thermal capability specified by the manufacturer to prevent deterioration or damage to the components.

Article 260. Unbalanced operation

Negative-sequence current of the generator shall not exceed the allowable limits specified by the manufacturer to prevent deterioration or damage to the components.

Article 261. Motor mode of operation

No generator shall be operated as a motor to prevent damage to the components; provided, however, that this shall not apply in case that one starts as a motor and a generator-motor runs as a motor in accordance with instructions for operation by the manufacturer.

Article 262. Operation inside capability curves

No ~~g~~enerator shall be operated outside its capability curves specified by the manufacturer to prevent deterioration or damage to the components.

Article 263. Vibration

Vibration of the ~~g~~enerator shall not exceed the allowable limits specified by the manufacturer to prevent deterioration or damage to the components.

Article 264. Prevention of an explosion of hydrogen

Appropriate measures for the hydrogen cooled generator, such as a proper hydrogen pressure, seal oil pressure, hydrogen purge, shall be taken to prevent an explosion of hydrogen due to leaks.

Chapter 3 Electric Motor

Article 265. *(deleted)*

Article 265-a1. General

Appropriate measures for the motors shall be taken to prevent damage to the components, etc. in consideration of its installation location and operating condition.

Article 266. *(deleted)*

Article 266-a1. Inspection of motor

Appropriate measures for the motor, such as inspection during operation and shutdown, shall be taken to prevent deterioration or damage to the components due to abnormal condition of temperature, vibration, noise, leak of lubricant oil or grease, flow of draft, voltage, current, etc.

Chapter 4 Transformer, Auto-Connected Transformer, and Oil Reactor

Article 267. General provisions

During operating transformer and oil reactor, their stable and durable operation must be maintained by the following items.

1. Monitoring temperature, load behavior and voltage level;
2. Strictly examining criteria on oil quality and insulation characteristics;
3. Keeping facilities for cooling, voltage regulator, oil protector and other facilities in good condition.

Article 268. Firefighting facilities

Fixed firefighting facilities, facilities for collecting oil under transformer (reactor) and oil exhausts from those points must be in readiness for operation.

Article 269. Numbering and signing

Symbol and description showing specification of powerhouse or transformer and the common name as regulations of load dispatch center must be displayed on the cover of outdoor transformer (reactor).

On the cover of single-phase transformer (reactor), it is necessary to indicate phase paint appropriately (in corresponding color).

Outdoor transformer (reactor) must be painted brightly with non-admixture paint which is weather and oil resistance.

Article 270. Power supply for cooling system

Generally, live motor of cooling system of transformer (reactor) must be powered by 2 sources. As for transformer (reactor) with forced circulation oil system, it is necessary to be equipped with auto-recloser for standby source.

Article 271. On-load tap changer

On-load tap changer of transformer must be in operation all the time, normally it runs automatically. It is necessary to check the operation frequency of on-load tap changer based on readings on the operation counter.

Article 272. Cooling system

Cooling system of transformer must ensure the operation of transformer at rated load.

Article 273. Forced cooling

As for forced oil immersed air-cooling transformer and forced oil immersed water-cooling transformer, their cooling system must be automatically switched on and off at the same time with the switch of transformer. The oil must be circulated forcedly and uninterruptedly no matter how much the load level is.

Article 274. Auxiliary Oil level

Oil in conservator of offline transformer (reactor) must be at the level equal to that corresponding to oil temperature in transformer (reactor).

Article 275. Overload of transformer

Each coil of oil immersed transformer is allowed to be overloaded for long time with current of 5% higher than the rated one of corresponding voltage level if voltage at that level is not higher than the rated voltage.

Moreover, depending on operating mode, transformer is allowed to be overloaded regularly. Overload limit and duration shall be based on the sample procedures on operation of transformer and instructions of manufacturer.

As for auto-connected transformer which has low voltage coil connected to power generator, synchronous compensator or load, it is necessary to check current at the common part of high-voltage coil.

Article 276. Working mode

Load current of each transformer except pole transformers must be metered hourly for a year, and the result of measurement shall be summarized and analyzed to think of expansion and replacement of transformer..

It is necessary to adjust mode and operating diagram of power supplying network based on metered data.

Article 277. Check of accident

When relay for inside failures of transformer is activated for alarm, it is necessary to examine outside of transformer (reactor), examine insulation resistance and take a gas ample in relay to analyze and test the combustion of gas. If insulation resistance is low or that gas is flammable or contains particles due to the disintegration of insulation materials, transformer (reactor) shall not be energized again..

Article 278. Close electric of transformer

When transformer (reactor) is disconnected automatically due to the action of protector for inside failures of transformer (reactor), that transformer (reactor) is allowed to be re-operated after investigating, testing and analyzing gas sample, fixing the detected error points, and confirming that there is no obstacle to the continuous operation.

Article 279. Oil insulator

Oil in conservator of transformer (reactor) must be protected from contacting ambient atmosphere directly.

Oil in oil insulator must be protected from oxidization and the wet.

Article 280. Repairs of the core of the transformer

In case of the repairs of transformer cores, crane device or other appropriate solutions should be used to lift up the inner part or the housing of the transformer according to the weight of transformer and installation situation.

Article 280-a. Passageway for crane truck

Passageway must be built for crane truck and other transportation means to move to the location of transformer for the on-site repairs or installation.

Article 281. Inspection of transformer

Transformer shall be checked in accordance with the contents of inspection prescribed in Vol.5.

Chapter 5 Distribution Network Equipment

Article 282. General provision

Owners of a facility should ensure working condition of electrical equipment of power distribution network not only in normal operating mode but also in short-circuit and over-voltage situation with every type of voltage and voltage under its rated values.

Operators of power distribution network must thoroughly understand diagram and instructions under allowable operating mode of electrical equipment in normal and breakdown condition.

Article 283. Exploitation distribution network

Once operating distribution network, it is necessary to frequently put segments and bus-bars system (except bypass one) as well as all electrical equipment (except standby one) into operation.

Article 284. Insulation of Distribution Network

Insulation level of electrical equipment must be matched with rated voltage of power grid. Insulation level of facilities to protect over-voltage must be in line with insulation level of electrical equipment.

In the case that electrical equipment is installed at dusty area, it is necessary to take measures for stable operation of insulators: as for outdoor distribution network, insulators of reinforced insulation shall be used. They will be cleaned and covered with silicon coat for protecting from the wet. For indoor distribution network, it is necessary to protect system from dust and corrosive gas. For distribution network assembly, it is necessary to use closed cubicles with insulator covered with silicon coat for protecting from the wet.

Article 285. Prevent effects from the high-temperature materials

The temperature of structures to be hot close to circuits and at the places where operator can touch easily must not exceed + 50^{o}C.

Article 286. Operating temperature

Indoor temperature of indoor distribution network in summer must not exceed + 45^{o}C, and it is necessary to give solutions for deceasing temperature of electrical equipment or of cooling air.

Article 287. Protection and safety

As for outdoor distribution network, it is necessary to have preventive measures to keep the system from animals and birds.

There must not be cement dust on the floor. It is necessary to arrange certain distance between plants and live parts of distribution network to avoid discharge.

Article 288. Protection of cable trough

Cable trough and duct of outdoor distribution network and indoor distribution network must be covered with noninflammable covers. The holes in house, wall and ceiling where cable goes through without cable trough must be covered with noninflammable materials.

Cable trough and duct must be kept clean and equipped with facilities for letting stagnant water out and firefighting materials with ≥ 0.75h firefighting level.

Oil storage system, gravel pit and waste oil discharge system must ensure to work well and protect the environment.

Article 289. Oil insulator level

Oil level of oil circuit breaker, measuring transformer and oil insulators must not exceed indicated level within allowable ambient temperature (maximum and minimum).

Oil in oil insulators must be protected from the wet and oxidization.

Article 290. Check of heating at joints

In order to avoid overheat at joints of bus-bar in distribution network, it is necessary to check the fixed or mobile thermo indicator periodically.

Article 291. Interlock

Power distribution network with the voltage from 3kV upwards must be equipped with interlocks to prevent wrong operation on disconnectors, section switch, circuit breaker, earthed switch, etc.

Operators who directly operate the above-mentioned equipment are not allowed to open interlock without permission.

Article 292. Protection action error

It is necessary to lock disconnector’s driven arm and low-voltage distribution cabinet of transformer, tram cat and other projects, which are mounted on the pole without encompassed fence.

Fixed stairs for reaching workplace must also be equipped with interlock as well as disconectors, and they should be locked.

Article 293. Grounding for equipment of distribution network

Grounding for equipment of distribution network of voltage from 3 kV and over, it is necessary to use fixed earthing switch

Steering lever of earthed switch’s drive must be painted in red, and its blade is covered in red and white.

Article 294. Indicator for switching position of breakers

Breaker and its drive must be equipped with indicator for positions to be switched.
As for breakers which have built-in drive, indicators that show their operating status (close or open), is necessary in either breaker unit or drive. As for breakers, which have their outer contacts for indicators, it is not required to equip such indicators.
As for drive of disconnector, earthed switch, circuit separator, short-circuit disconnector and other equipment which have partitions, it is necessary to equip indicators.

Article 295. Safety of operation of distribution network

At distribution network, it is necessary to equip mobile grounding facilities, devices for first aid in case where accidents, protecting and firefighting equipment by following fire regulations and occupational safety (sand, extinguisher, etc.)

As for power distribution network, if self-firefighting teams are available, the above-mentioned equipment and facilities shall be kept at that team's headquarters.

Article 296. Inspection and testing

Check and test of distribution network should be carried out appropriately based on technical standards for inspection (Vol.5).

Article 297. Maintenance and periodic overhaul

The overhaul of distribution network equipment should be carried out with appropriate method and intervals to maintain the reliability and economical operation. The interval should be set by the owner based on the condition and actual failure of the equipment.

Chapter 6 Battery System

Article 298. Operating voltage

During operation, battery system must be ensured to operate stably and durably at required voltage on DC bus-bar in normal and failure operating mode.

Article 299. Inspection

New battery shall be checked in accordance with the contents of inspection prescribed in Vol.5.

Article 300. Ventilation of battery room

Ventilators with draft fan installed in a battery room in power plants must be operated according to the specification of battery and the status of installation.
Battery rooms of transmission substation must be ventilated as the extent of battery evil influence for the environment.

Article 301. Control voltage

The voltage of DC bus which supplies power to protection system such as relays, meters, and automatic control equipment is allowed to be higher by 5% than the rated voltage of the receiving end in normal operation condition.
Main DC line shall be equipped with two power sources.
Once earth fault in DC network occurs, it is necessary to disconnect the fault part from DC network promptly.

Article 302. Signing and numbering

The batteries and accompanied equipment shall be signed in accordance with Vol.3 Chapter 3 Section 6.

Article 302-a1. Temperature of battery compartment

Temperature of battery compartment should be maintained from $10C^{o}$ to $30C^{o}$ for the effective operation and duration of the battery.

Chapter 7 Overhead Power Lines (OPL)

Article 303. (deleted)

Article 304. Implementation of repair and overhaul

It is necessary to implement periodical checks, measurements as well as repairs of faults or abnormal phenomenon for overhead lines to avoid their structural parts from breaking easily.

As for the maintenance of overhead lines, it is necessary to select more effective and economical means for repairs and overhauls. When the overhaul is carried out, it is necessary to confirm that faulty point is restored to the initial performance.

The overhaul of overhead power lines equipment shall be carried out by the owner with an appropriate method and interval to maintain the reliability and economical operation. The interval of overhaul shall be set based on the condition and actual failure of the equipment.

Technical maintenance and repair of overhead power lines must be carried out at the same time to minimize outage time.

Article 305. Implementation of design

For agreement on technical conditions for designing overhead power lines, designer must raise their request to power company and power network management units on special conditions (climate condition, pollution and other local factors) of the area where overhead power lines pass through for the consideration in designing overhead power lines.

Article 306. Management of materials

When accepting overhead power lines for putting into operation, power network management units must have constructing units to provide technical materials, which are in accordance with requirements in regulations on checking and accepting power network projects.

Article 307. Checking sites

The overhead power lines under construction works, which will be handed over to a power network management unit for management and operation, must be watched over technically by the power network management unit during construction works.

Article 308. Safe protection for power network project

Power network management unit must strictly conduct safe protection for power network projects.

Power network management units must share information about trees or periodical repairs with other agencies and organizations near the areas where overhead power lines pass through.

Power network management units must have solutions to avoid troubles with other individuals or organizations and violating related rules in safety corridor of overhead power lines..

Article 309. Explanation on danger and damage by repair and overhaul

Scheduling on repairing overhead lines traversing over cultivating areas (plantation, a forestation yard, field, garden, etc.) must be done under the agreement with owners of those areas.

Article 310. Cutting tree in safety corridor of the route

The route of overhead lines must be cleaned garbage, plants, etc. periodically, and kept safe by avoiding nearby fires which damage the lines. In safety corridor of overhead power lines, it is necessary to cut off all trees likely to damage the lines.

Article 311. Maintenance of signals and signs

Signals and signs must be kept in good condition and broken or lost signs must be repaired:

1. Signs on banks at gaps of a river where overhead lines cross boats and crafts pass by frequently and signs over roads;
2. Waning lights and signal paint mounted on high poles;
3. Signs alert points which are put permanently on poles of overhead lines;

Article 312. Installation and maintenance of warning plate and barriers for railway

Power network management units must monitor and ask railway, road management units to put waning plate or barriers at the railway sections where oversize cargos and cranes likely to pass by.

Installation and maintenance of such warning plate or barriers shall be implemented by railway, road management unit.

Article 313. Patrol

Patrol for overhead power lines shall be conducted at following times.

- Periodic patrol
- Emergency patrol
- Extraordinary patrol (after long vacation or before typhoon, etc.)

Article 314. (deleted)

Article 315. Cleaning of insulator

In the cases where pollution problem is serious, insulators must be cleaned, replaced, or anti-pollution insulators will be used

Article 316. Compliance with standard of inspection

Check and test of overhead line shall be carried out based on technical regulations for inspection (Vol.5). Countermeasure for defection

Article 317. Countermeasure for defection

Failures and shortcomings detected during the check on overhead lines must be recorded in diary (or particular book), and they shall be fixed immediately or during maintenance or overhaul of overhead lines depending on the failure.

Article 318. *(deleted)*

Article 319. *(deleted)*

Article 320. Restructuring of supporting structures

Change of poles' structures as well as other structures of overhead lines must be under full set of technical materials which quality is appropriated and approved by a chief engineer of power network management unit.

Article 321. Spare parts

Accessories and spare parts must be reserved in power network managing units so that they can be fixed immediately after the breakdown occurs in overhead lines.

Article 322. Operating management unit

In the cases that various operating management units share the same poles for mounting lines, preparation of schedule on repairing each line must be agreed each other. In the cases where a repair is implemented due to breakdown, it is necessary to inform it to the related units sharing the same pole for their lines in advance.

Chapter 8 Power Cable Lines

Article 323. General provisions

During power cable lines are under operating conditions, it is necessary to carry out maintenance and overhaul for their reliable operation.

Article 324. Load cables

The largest load current allows the cable is determined under Chapter 2-2-1 Technical Regulations Volume 1.
It is necessary for each cable line to specify the maximum allowable load current on actual operation. The maximum allowable load current is identified at the sections which has the highest t temperature.

It is possible to determine the maximum allowable load current based on test results; provided that temperature of cable core does not exceed regulations. Temperature of cable core in such test must be checked at the sections which seemed to have the highest temperature.

Article 325. Temperature in tunnels and cellars

Ambient air temperature in cable tunnels (cellars) must not exceed 45^{o}C in summer. In case that ambient air temperature exceeds 45^{o}C, it is necessary to confirm that the requirements in cable design are appropriate.

Article 326. Overload of cables

Power cable lines must be operated at less than allowable temperature. If power cable lines are operated in overload, they shall not be permitted to exceed the temperature in cable specifications.

Article 327. Oil pressure

As for each oil-filled power cable, it is necessary to stipulate allowable limit of oil pressure. In the case that oil pressure of cable exceeds allowable range, such cable shall be de-energized. The cable shall not be allowed to be energized unless the faults are detected and fixed.

Article 328. File documents

When accepting power cable lines to put in operation, apart from required technical materials, which are stipulated by construction and installation companies, management units of power cable lines must be handed over the following documents:

a) The map of power cable lines at a scale of 1:200 or 1:500 (the scale depends on the development of transport and telecommunication systems of the region where power cable lines pass through).

b) Check-lists on underground facilities, which are clearly listed that other underground cable lines (telecommunication cable, etc.) crossed and passed nearby by the power cable lines, and installation of underground cable blocks and connection boxes.

c) Check-lists on conditions of cables winded on the drum. (The result of acceptance inspection after transportation of cables is described in the lists, if necessary.)

d) Cross-sectional drawing at intersection where power cable lines cross roads, other cable lines and cable blocks for power cable lines with voltage not less than 35kV, and cross-sectional drawing to be easily comprehended cable sections where many power cable lines with voltage from 6kV to 10kV are arranged complexly.

e) Check-lists on analysis of soil samples which identifies characteristics of cable section.

Article 329. Supervision of implementation

Power cable lines with all voltage are constructed, then they are handed over from construction companies to operation and management companies. Thus the expecting management unit or power company must arrange technical supervision during laying cables out and construction works of power cable lines.

Article 330. Protection of structure

Metal supporting structures must be painted periodically or galvanized to be protected from rust and heat.

Article 331. *(moved to Article 276)*

Article 332. Checking power cable

Check and test of power cable lines shall be carried out based on technical regulations for inspection (Vol.5).

Besides, in case of failures of power cable lines, patrol for power cable lines shall be carried out for public safety and cable structure conservation after their occurrence.

Article 333. Protection of electrochemical corrosion

Within the areas where electric railway passes through or its nearby, power cable lines shall not be permitted to put into operation unless the countermeasures for protection of electrolytic corrosion are performed.

For power cable lines in the above-mentioned areas, it is necessary to measure stray current for establishing and calibrating the voltage diagram of cable network (or each cable sections) and for providing countermeasure in the area.

Article 334. Protect of power cable line attach mechanical actions

Excavation or any works of soil at safety corridor of power cable line shall not be allowed to implement unless the management unit of power cable lines permits.

Article 335. Building near power cable line

When the power cable equipment laid underground is influenced by the construction work of other utilities, maintenance engineer shall observe the construction work. Also, the use method of protection such as stringing way and sustaining way shall be considered between construction workers and engineers who are responsible for targeted equipment.

Article 336. Proclaim Information

Power network managing unit must inform the way and procedures for carrying out activities or excavation nearby the route of safety corridor power cable lines to agencies and residents in the areas where power cable lines pass through.

Article 337. Occupational safety

During check of power cable lines and trough for detecting their faults, it is necessary to strictly abide regulations on occupational safety.

Chapter 9 Protective Relay and Automation

Article 338. General provisions

Electrical equipment of power plants and networks must be kept from short-circuit and failure in normal operating mode with protective relay, circuit-beaker or fuse and automatic electrical facilities including auto-regulating and auto fault-preventing devices.

Article 339. Responsibility to management and operation

Electric power utilities, power suppliers, electric providing unit and grid operators should take responsibility to manage and operate protecting system for relay, auto electrical equipment, electrical indicating, metering instruments and secondary circuit.

Article 340. Required to ensure operating procedures and operating facilities

During operation, it is necessary to maintain normal operation of facilities' protecting relay, measuring equipment, auto electrical equipment and secondary circuit under the national standards and technical regulations (temperature, humidity, allowable vibration and difference of working parameters against rated ones, etc).

Article 341. Signing and numbering

The Owner of the protective relay and automation facilities should equip a panel on the facilities to be recognized visibly and easily. On panel of electrical protective relay and automation as well as on control panels and desks, their name should be described on both sides (front and rear) as it is in regulations of load dispatch center. The sign on facilities must be written or marked on both sides in accordance with the diagram.

Article 342. Inspection of related facilities to protective relay and automation facilities

The owner should make operator to be in charge of inspecting the accuracy of fuse, circuit breaker in controlling circuit, testing breaker and other equipment, exchanging high frequency protective signals, metering unbalanced current and bus-bar differential protection, testing auto-reclosing facilities, backup power closer, auto wave recorder and other equipment and facilities.

Period for checking and testing equipment and facilities as well as operating technology of operator once detecting the difference against standards shall be under the local regulations.

Article 343. Inspection of protective relay, automation facilities

Electrical protective relay and automation facilities and secondary circuit must be checked and calibrated periodically in accordance with existing regulations and guidelines.

If the above facilities malfunction or do not function, they must be checked additionally with special procedures after the faults were found.

Article 344. Secondary winding of current transformer and voltage transformer

Secondary winding of current transformer must not be opened; and secondary winding of voltage transformer must not be short-circuited. Secondary circuit of current transformer and voltage transformer must have earthed at one point.

Article 345. Requirement of protective relay, automation facilities of operating circuit

Protective facilities such as fuse and circuit-breaker of operating circuit must be ready for operation.

Circuit breaker to be put fuses and fuse wire must have symbols of its function and current.

In panels (cabinets) of electrical protective relay and automation facilities, where operators switch circuit by locks, it is necessary to note corresponding position of above switchers in accordance with using modes.

Operating practices on such switchers must be noted in operating diary.

Chapter 10 Grounding Equipment

Article 346. General provision

Safety of grounding equipment for man and electrical equipment must be ensured in every operating mode.
All metal parts of electrical equipment and works, which can be suffered from electrical leakage once their insulation broken, must be earthed.

Article 347. *(deleted)*

Article 348. *(deleted)*

Article 349. *(deleted)*

Article 350. *(deleted)*

Article 351. *(deleted)*

Article 352. Time for grounding resistance measurement

It is necessary to meter resistance of grounding equipment as follows:

a) After assembly, refurbishment or overhaul of power plant, transmission substation and lines.
b) In the case where maintenance of electrical poles mounted earth line of 110kV line upwards was carried out because the insulator is broken or disrupted by electric arc.

Article 353. Earthing area has high corrosive

As for grounding equipment of electrical works and poles which are often rusty, the excavation for checking shall be carried out more frequently under the decision of responsible people of field maintenance office.

Chapter 11 Over-Voltage Protection

Article 354. *(deleted)*

Article 355. *(deleted)*

Article 356. *(deleted)*

Article 357. Compensation of capacitive

In the network system where a lot of underground cables are installed, large capacitive current is added to earth fault current. Therefore, such large earth fault current may make protective devices maloperate or cause electromagnetic influence on communication lines.
Therefore, if earth fault current becomes larger than a certain value, compensative reactor shall be installed in order to reduce the aforesaid capacitive current. The capacity of the compensative reactor shall be selected considering the above-mentioned adverse affect on function of protective devices and inductive influence on communication lines.

Article 358. Arc suppression coils

Capacity of arc suppression coil must be selected based on the capacity to ground of power network by considering power network development plan.
Grounding arc suppression coils must be installed in transmission substation which connected to compensation power line of not less than 3 circuits.
Arc suppression coils are not allowed to be installed in dead end substations.
Arc suppression coil must be connected to a neutral point of transformer, power generator or synchronous compensator through a disconnector.
Generally, transformer with “star-delta connection” shall be used to connect arc suppression coil.
It is prohibited to connect arc suppression coil to the transformer which are protected by fuses.

Article 359. Suppression coils regulator

Arc extinguishing devices must be equipped with a resonance regulator.

Article 360. Voltage deviation

In the case where power network is not suffered from earth fault, asymmetry voltage shall not exceed 0.75% of phase voltage by compensation of capacitance or reactance.
In the case where power network is suffered from earth fault, voltage deviation at neutral point is allowed not to exceed the following values.

Long term	15 %
Within 1 hour	30 %

Article 361. Manual regulator for arc suppression coil

When arc suppression coils with manual regulators are used, the identification of regulating level must be carried out by a resonance compensation meter. If such equipment is not available, the selection of regulating level must be based on results of metering earth fault current, capacitive current and compensation current with taking account of voltage deviation of neutral point.

Article 362. Switching operations

In 110 - 220kV transmission substation, in order to prevent over-voltage due to self-arising neutral deviation or during arise of dangerous ferroresonance, it is necessary to start operating from grounding neutral point of transformers, which are connected to no-load bus-bar system equipped with 110kV and 220kV induction transformers.

Before disconnecting no-load bus-bar system equipped with 110kV and 220kV transformers from power network, neutral point of feeding transformer must be earthed.

As for 6 - 35kV power network and connections, measures to prevent self-arising neutral deviation must be implemented if it is necessary.

Article 363. *(deleted)*

Article 364. *(deleted)*

Article 365. *(deleted)*

Chapter 12 Electrical Indicating and Measuring Instruments

Article 366. Management responsibilities

Power Companies shall take responsibility to manage and supervise electrical indicating and measuring instruments and systems. The management, monitoring and calibration of measurement equipment is assigned for each level of management.

Article 367. Inspection period

The national and regional checking period for electrical indicating and measuring instruments shall be stipulated by the national and regional standards and quality control units.

Article 368. Close electric of working

No electrical indicating and measuring instruments shall be allowed to be installed and put in operation unless they satisfy the requirement on standards, regulations, and guidelines of manufacture on such electrical indicating and measuring instruments.

Article 369. Checking

Structures, implementing method and report of the inspection for electrical indicating and measuring instruments must be in line with requirements of standardized measuring materials stipulated by the national and regional standards and quality control units.

Article 370. Installation of protection circuit

Electrical indicating and measuring instruments for contact transformer and transmission lines at the voltage from 220kV and above in power plant and transmission substations, where permanent on-duty staffs are always available, must be installed separately for each connected circuit. It is not allowed to share one electrical measuring device for metering many connected circuits.

As for other metering circuits, it is allowed sharing the electrical measuring device or using device of central testing facilities.

Article 371. Principle of installation

Principle installation of electricity meters shall comply with Chapter 2-6 measure the electrical system in the Technical Regulations Volume 1
It is necessary to install meter for station service power of operating and backup components in power plants. In addition, thermal power plants should be equipped with electricity meter for main electrical motor in mechanical line of each boiler and turbine, accordingly it is possible to recognize electricity consumption for each segment of technological line.

Article 372. Installed capacity

Electricity consumption in each transmission substation of power system must be calculated separately for their self-station service, for internal activities of electricity units as well as for other consuming components, which consume electricity from auxiliary bus-bar of transmission substation.

Article 373. Installed meter at feeders

Electrical meters must be installed at feeders connected to power grid of transmission substations with voltage from 35kV and above to calculate energy balance to identify increment in power loss of components in power network.

Chapter 13 Illumination

Article 374. General provision

Lighting equipment shall be operated to light up the places necessary to operate and patrol facilities safely, and prevent intrusion onto the premises.

Signal lights for smokestacks shall be installed in accordance with “Decree on the management of heights of aviation barricades and battlefields for management and protection of Vietnam's airspace” (No. 20/2009/ND-CP).

Chapter 14 Hydrogen Generation Station

Article 375. *(deleted)*

Article 376. Check of equipment condition

Appropriate measures for the hydrogen generator equipment shall be taken to prevent damage to the components and an explosion of hydrogen due to leaks.

Article 377. Protective devices

Protective devices of hydrogen generation equipment shall be operated properly and equipment shall be safely shut down when abnormal condition occurs. In addition, the equipment shall not be restarted before removing the cause of the abnormal condition.

Article 378. Safety valve

Safety valves in hydrogen and oxygen pressure regulators and in hydrogen generation equipment shall be calibrated at design values.

Article 379. A pre-purge and post-purge

Hydrogen generation equipment shall be purged with the appropriate gases and methods for safety before and after their operation.

Article 380. Ventilation of the inside of a vessel

Inside check of vessels of hydrogen generation equipment shall be carried out for safety in accordance with Article 100 of national technical regulation on electric safety (QCVN 01:2008/BCT).

Article 381. *(deleted)*

Chapter 15 Energy Oil

Article 382. Oil Management

“Energy oil” is defined as the oil types which are used in power system and shall be distinguished from “fuel oil” which is the oil types used as the fuel for thermal power plants.

Oil management are operation activities including back-up, purchase and checking oil which is permitted to use in Vietnamese power system in order to ensure safety operation for oil system of power plants and storage equipments according to the technical requirements and environment protection, and preparing plans and methods to treat leakage oil and water contaminated oil and utilization.

Article 383. Inspection of insulating oil

1. Insulating oil shall be checked in accordance with the contents of inspection prescribed for each facility in Part 2 of technical regulation Vol.5.

2. The electrical equipment with insulating oil which contains polychlorinated biphenyls (PCBs) shall not be operated in the electric circuits.

Article 384. Insulating oil treatment

When the acid content moves in an upward trend as a result of the inspection for insulating oil, the absorbents shall be exchanged, dried or regenerated.

Article 385. Hydraulic system oil for turbine

Condition of hydraulic system oil for turbine shall satisfy used oil limits specified by the manufacturer.

PART 7
LOAD DISPATCH COMMAND – OPERATION

Chapter 1 Load Dispatch Command

Article 386. General provision

National load dispatch center, local load dispatch center and all owners of electrical facilities such as substations, transmission lines, power plants, etc. shall take responsibility to ensure the following items. based on related regulations.

1. Ensure sufficient electricity supply;
2. Ensure uninterrupted electricity supply for customers and stable operation of entire power system;
3. Ensure electricity quality as stipulated standards (on frequency, current voltage, etc.);
4. Ensure united power system and integrated power system and other single power systems to operate efficiently, to consume rationally fuel volume under targeted load curves.

Article 387. Load dispatch command

Load dispatch command is sent from load dispatch center. Load dispatch center must be equipped with necessary instruments for load dispatch command in accordance with their standards.

Article 388. Submission of annual schedule on overhauls and repairs

Annual master schedule on overhauls and repairs of power plants and networks shall be submitted to National Load Dispatch Center.

In the case that schedule on overhauls and repairs is changed, the change must be approved by National Load Dispatch Center.

Article 389. Allowable load capacity of electrical equipment and conductors and power transmission lines

Allowable load capacity of electrical equipment and conductors must be set up by load dispatch division of national or regional load dispatch center in cooperation with local electricity units and power plants. This allowable load capacity must be based on operating mode and setting values of protective relay and automation system. This allowable load capacity must be revised at least once a year.

Article 390. Load curve of hydropower plants

Load curve of hydropower plants must in line with “Regulations on using water resources” by considering the demand of national economic sector (waterway transportation, irrigation, aquiculture, water supply, etc.).

Article 391. Keeping of assigned load curves and spinning reserves of power plants

Power plants are required to complete their assigned load curves and spinning reserves. In the case where the assigned load curve cannot be obtained due to any reason, on-duty staffs must inform it to national load dispatch center and/or regional load dispatch center of power system of situation immediately.

Dispatcher of regional load dispatch center has right to change load curve of power plant if it is necessary, but should maintain total load curve of entire power system set up by national load dispatch center. Change of total load curve must be permitted by dispatcher of national load dispatch center.

Only dispatcher of national load dispatch center has right to change power diagram among regional integrated power systems.

Dispatcher has right to ask power plant to increase its capacity to the maximum or to minimize its capacity based on technical condition of equipment.

Article 392. Frequency of power system

Current frequency of power system shall always be maintained in compliance with the existing regulations.

Article 393. Voltage of power system

Voltage of power system must be always maintained at normal level, corresponding to targeted voltage.

Article 394. Stop procedure of various control system

In order to disconnect equipment, automatic protective relay system, automatic frequency and power transmission regulator, instruments of load dispatch command and technology control from their operation and standby for repair or inspection, regardless of whether it is scheduled or not, the request in writing must be submitted to load dispatch center.

Article 395. Unscheduled repair

In particular cases when the equipment requires unscheduled repair or fault clearance, requests must be submitted to and approved by load dispatch center.

Article 396. Allowable time in the request

Time to be consumed for manipulations related to putting equipment in repair and putting equipment or lines in operation, time for burning boiler or starting up turbine shall be counted to allowable time in the request.

The approval from Load Dispatch Center is required in case that the time is changed.

Article 397. Stop of operation

Even the approved request is available, every time when the equipment is disconnected from its operation and standby for repair or inspection, it is required to receive the approval from the Load Dispatch Center before starting repair or inspection.

Article 398. Fault clearance procedures

Specific procedures on fixing faults must be available at each load dispatch office and electrical instrument which on-duty staffs are available.

In the cases where the faults occurred, load dispatch center and related electric utilities must implement every measure to restrict the faults' widespread and recover electricity supply to the customers as soon as possible.

Chapter 2 Operation on Energizing and De-Energizing Electrical Equipment

Article 399. Connection diagram of equipment

In control rooms of power plants and transmission substation (hereafter it includes base transmission substation which inspect and control other substations) and in load dispatch offices, connection diagram (diagram - simulator) of equipment must be installed at commanding site of dispatcher in those power plants, transmission substations and load dispatch offices.

Every change in connection diagram as well as change of grounding points must be shown clearly in diagram (or diagram - simulator) right after operation.

As for load dispatch offices and base transmission substations where connection diagram of electrical equipment is kept, which to be controlled from those load dispatch offices and base transmission substations, it is not necessary to have operating diagram of such electrical equipment.

Chapter 3 Operator

Article 400. Operator

Electric power utilities, power suppliers and grid operators should assign the suitable engineer who own required qualification stipulated in relative standards as operator.

Operators of power systems, power plants, networks and steam system in this article is:

1. On-duty staffs work at ongoing generation sections as scheduled;
2. Operators and repairers for operation and operation in generation sections;
3. On-duty managers in operating shift, including:
   (1) On-duty dispatcher of national power system;
   (2) On-duty dispatcher of regional power system;

(3) On-duty dispatcher of single power systems;

(4) On-duty dispatcher (on-duty engineer) of local electricity units, branches or thermal units;

(5) Shift leader (on-duty engineer) of power plant.

Article 401. Maintenance of equipment for power sector

Maintenance of equipment for power sector shall be carried out by operators frequently or periodically as schedule for one instrument or group of equipment.

Article 402. Responsibility for supervise and maintenance of equipment and machineries

Electric power utilities, power suppliers should make operators supervise and maintain equipment and machineries without faults for the smooth operation. Moreover, they should maintain for the cleanness and tidiness as regulations.

Article 403. Inspection of facilities for operation

Operator must inspect the technological equipment, firefighting equipment, alerting signals, telecommunication equipment as well as correcting the watch for accurate time at working place.

Chapter 4 Dispatching and Controlling Devices

Article 404. Load dispatching and controlling devices

Load dispatch offices of Power Company, power plants, power network units and branches must be equipped with dispatching and controlling devices, in accordance with standards on technological design for load dispatch center and points of dispatching and controlling devices of power system. In addition, such devices must be in line with essential rules on amount of remote mechanical instruments and telecommunication equipment in power system.

Controlling devices must be always kept in smooth operation.

Article 405. Telecommunication equipment and remote control system

The customer substations of voltage 35kV or more or its control room that exist in electric railway system, oil manifold system and vapor and heat supply system must be equipped with telecommunication equipment and remote control system which are in good conditions. Amount of remote control system of above-mentioned substations shall be determined based on technical requirements of relevant equipment for substation with voltage 35kV or more. Compositions of relevant equipment and its maintenance shall be complied with the regulations of each section.

Article 406. Operation of telecommunication network, remote system and communication transmission system

Operation of telecommunication network for generation, remote system and communication transmission system shall be carried out by telecommunication and remote terminal unit managing team.

Article 407. Documents for load dispatching and controlling devices

In order to operate load dispatch and technological controlling devices, operate computers and peripheral devices, computers' terminals, managing group of dispatch command and technology controlling devices and other generation branches, must have designing documents, materials of manufacturers, operating diagrams as well as technical passport of equipment and operation check-list

Article 408. Protection for landline telecommunication devices

Landline telecommunication devices must be protected and kept from hazardous impacts and interferences caused by high-voltage instrument, in line with "Regulations on protecting landline telecommunication devices of power system from voltage impact and hazardous current"

Article 409. Standby supply sources for load dispatching and controlling devices

Dispatching and controlling devices as well as computer's devices which are involved directly in controlling process must be equipped with standby supply source which can auto-reclose once facing outage.

Such standby supply sources must be in line with requirements on "Instructions on designing power supply source for dispatching and controlling devices in power system".

Article 410. Inspection of load dispatching and controlling devices

Electric power utilities, power suppliers must periodically inspect all load dispatching and controlling devices especially the positions of switches, connectors and faults alerts.