Foreword

According to the requirements of Document JIAN BIAO [2009] No.88 issued by the Ministry of Housing and Urban-Rural Development (MOHURD) "Notice on Printing and Distributing 'the Development and Revision Plan of National Engineering Construction Standards in 2009'", reviewed and finalized based on wide and extensive investigations and studies made, practices summarized, comments requested as well as references to international codes and advanced foreign standards.

The standard consists of 3 chapters, covering: general provisions, basic engineering design and detail engineering design.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China is in charge of the administration of this standard, China Petroleum & Chemical Corporation (Sinopec Group) is responsible for its routine management, and Sinopec Luoyang Petrochemical Engineering Corporation is responsible for explanation of specific technical contents. If any comments and recommendations are proposed in implementation of this standard, please send your comments/ recommendations to Sinopec Luoyang Petrochemical Engineering Corporation (Address: No. 27 Zhongzhou West Road, Luoyang City, Henan Province, P.R. China, Post Code: 471003, E-mail: wanghq.lpec@sinopec.com) for reference in future revisions.

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Contents

1 General provisions

1.0.1 The standard is developed to improve the oil depot engineering design quality and unify the content and details of design documents.

1.0.2 The standard is applicable to compilation of documents on basic engineering design and detailed engineering design of grass-root, expansion and revamping oil depots.

1.0.3 The design documents of oil depot should be compiled on the discipline or unit(main item)basis.

1.0.4 The file directory should be prepared for the design documents of oil depot.

1.0.5 Preparation of individual chapter in the basic engineering design document shall comply with the requirements on application for approval and construction of the project.

1.0.6 In addition to this standard, the preparation of the design document for oil depot shall also conform to the current applicable national codes and standards.

2 Basic engineering design

2.1 General specification

2.1.1 General specification shall cover the project overview, design basis, design principle, design scope, design fundamental, main technical schemes, environmental protection scheme, safety facilities setup scheme, occupational disease protection facilities design scheme, energy-saving measures, main tech-economic indicators, staff deployment, applicable codes and standards on design, existing problems and suggestions, etc.

2.1.2 Project overview shall make clear the scale of project, the nature of construction and external supporting conditions available for the project, etc.

2.1.3 Design basis shall include the feasibility study report and approval document, special assessment report and approval, project design contract, related minutes of meeting, the correspondences from the client and the authority, etc.

2.1.4 Design principles shall include the applicable national project construction regulations, policies and requirements, technology selection principles, state-of-the-art process and state-of-the-art equipment selection principles, instrument & control level, project construction reliance principles, way and proportion of material in and out of the warehouse, safety and environmental protection, energy utilization principles as well as material turnover frequency, turnover rate, days of storage, etc.

2.1.5 Design scope shall describe the design scope of project and main works of project.

2.1.6 Design basis shall describe the main properties of materials, utilities conditions, meteorological conditions, geological conditions, etc.

2.1.7 The contents of main technical schemes shall comply with the following requirements:

1 The process scheme shall describe the way of material in and out of the warehouse, way of storage, transfer scheme, metering scheme, piping layout scheme and selection of key equipment, etc.

2 The instrument & control scheme shall describe the automation level and control system configuration.

3 The general plot plan and transportation scheme shall describe the overall plot plan, elevation arrangement, rainwater drainage and transportation considerations, etc.

4 The civil engineering scheme shall clearly describe the schemes of building, structure, heating and ventilation, etc.

5 The utilities scheme shall make clear the schemes for water supply and drainage, power supply, telecommunication, heat supply and air supply, etc.

6 The support facilities scheme shall make clear the way on how to arrange the office building, central control room and labortory, etc.

7 The fire-fighting facilities scheme shall describe the availability and distribution of fire-fighting facilities, and fire safety, etc.

2.1.8 The environmental protection scheme shall describe the source of pollution, the measures of pollutant discharge and environmental protection.

2.1.9 The design scheme of safety facilities shall outline the hazards and harmful factors involved in

the project as well as the safety facilities and measures adopted in the design.

2.1.10 The design scheme of occupational disease protection facilities shall outline the occupational disease hazards identified in the production process as well as the occupational disease protective facilities and measures adopted in the design.

2.1.11 Energy-saving measures shall include the main energy saving measures and energy consumption indicators.

2.1.12 The main tech-economic indicators shall comply with the following requirements:

1 Utilities consumptions shall include annual consumption of electricity, water, compressed air, steam and nitrogen, etc.

2 The main cost estimate indicators shall include the project investment, loan interest during construction and initial working capital.

3 The construction land shall clearly list out the used area and acquisition area.

2.1.13 Staff deployment shall make clear the staffing at different positions and total staffing.

2.1.14 The name and serial numbers shall be clearly indicated for the applicable standards.

2.1.15 In the existing problems and suggestions section, the unimplemented issues requiring further optimization shall be described including the project technical schemes, supporting condition, special assessment report and approval, etc.

2.2 Process

2.2.1 The basic engineering design documents for the process section shall consist of the following:

1 Description;

2 Battery limit condition table;

3 Pipe list;

4 List of process equipment;

5 List of special valves;

6 Process equipment data sheet;

7 Equipment specification;

8 Process flow diagram;

9 Utilities flow diagram;

10 Piping & instrument diagram(P&ID);

11 Utility piping & instrument diagram(U&ID).

2.2.2 The content of description shall describe the following requirements:

1 Design principles should include the applicable national project construction regulations, policies and specifications, technology selection principle, state-of-the-art process and state-of-the-art equipment selection principle, instrument & control level, project construction supporting conditions, way and proportion of material in and out of the warehouse, safety and environmental protection, energy utilization principle as well as material turnover frequency, turnover rate, days of storage, etc.

2 Design scope shall clearly describe the division of process unit(main item)and the main works of project.

3 Design basis shall make clear the properties of material, utilities condition and meteorological condition.

4 Design scheme shall clearly describe the design capacity, equipment configuration, main process operating conditions, way of heating and thermal insulation requirements, instrument & control level and control requirements, etc., as well as the list of storage tanks, list of boilers, list of cooling and heat exchange equipment, list of pumps, list of loading & unloading equipment, statistics of heat and air supply loads, etc.

5 Process description should outline the functions on an individual system basis, focusing on storage, transportation, tank switching operation, blending, loading & unloading, dosing, heat supply and air supply, etc.

6 Selection of main equipment shall cover selection of storage tank, boiler, cooling and heat exchange equipment, loading & unloading equipment, pump, compressor and other small equipment.

7 Consumptions should be clearly listed in separate spreadsheets the consumption of electricity, fresh water, cooling water, hot water, steam, compressed air, nitrogen, fuel gas and fuel oil, etc., which shall comply with the requirements of Table 2.2.2-1 to Table 2.2.2-5.

Table 2.2.2-1 List of consumption for electricity

S/N	Equip. no.	Voltage (V)	Q'ty of equip. (set)		Motor capacity (kW/set)		Shaft power (kW/set)	Annual hours (h/a)	Annual electricity consumption (kW·h/a)	Remark
			Operation	Standby	Operation	Standby				
1										
2										

Table 2.2.2-2 List of consumption for fresh water and cooling water

S/N	Location	Normal(continuous/intermittent) (t/h)	Max.(continuous/intermittent) (t/a)	Max. at one time (t)	Remark
1					
2					

Table 2.2.2-3 List of consumption for steam and hot water

S/N	Location	Normal(continuous/intermittent) (t/h)	Max.(continuous/intermittent) (t/a)	Max. at one time (t)	Remark
1					
2					

Table 2.2.2-4 List of consumption for compressed air and nitrogen

S/N	Location	Normal(continuous/intermittent) (Nm^3/min)	Max.(continuous/intermittent) (Nm^3/min)	Max. at one time (Nm^3)	Remark
1					
2					

Table 2.2.2-5 List of consumptions for fuel gas and fuel oil

S/N	Location	Normal(continuous/intermittent) (t/h)	Max.(continuous/intermittent) (t/a)	Max. at one time (t)	Remark
1					
2					

8 The safety & environmental protection scheme shall clearly describe the main safety & environmental protection measures adopted in the design.

9 The names and serial numbers shall be clearly indicated for the applicable standards.

10 In the existing problems and suggestions section, the unimplemented issues requiring further optimization shall be described including the project technical schemes, supporting condition, special assessment report and approval, etc.

2.2.3 The battery limit condition tables shall list out the process materials and utility medium materials going to and exiting from the project of design scope, including nominal diameter of pipes, medium name, medium phase state, flow direction, flowrate(normal/max.), operating temperature(normal/max. ormin.), operating pressure(normal/max.), thermal insulation, heat tracing and way of transferring, etc.

2.2.4 The pipe list shall list out the pipe number, nominal diameter, medium name, pipe starting and terminating points, medium phase state, density, content of corrosive medium, operating temperature (normal/max. ormin.), operating pressure (normal/max.), design temperature, design pressure, pipe class, thermal insulation, heat tracing, etc.

2.2.5 The list of process equipment shall be formulated on the equipment category basis to include equipment tag number, name, quantity, operating temperature, operating pressure, design temperature, design pressure, specification, principal material, weight, thermal insulation and corrosion protection, etc. For the package equipment to be delivered, the scope of package shall be indicated.

2.2.6 The list of special valves shall indicate the tag number, name, main operating parameters, specifications and quantity of each type of valve, such as safety valve, relief valve, reducing valve, nitrogen sealing valve, breathing valve, etc.

2.2.7 The content of process equipment data sheet shall comply with the following requirements:

1 The equipment and vessel data sheets shall list out the design data necessary for mechanical design of equipment, including operating parameter, design parameter, structure parameter, medium name, content of special(corrosive) medium, corrosion allowance, nozzle flange parameter and thermal insulation, etc.

2 The boiler data sheet shall list out the data necessary for boiler design, selection and inquiry, including evaporation capacity, steam pressure and temperature, boiler type, steam quality, site condition, explosion-proof grade, soot blowing type, burner atomization type, scope of supply and nozzle flange parameter, etc.

3 The cooling and heat exchange equipment data sheet shall list out the equipment name, tag number, quantity, specification, process operating parameter, physical properties of heating medium, physical properties of heated medium, structure parameter, opening description, mechanical design data, construction material, manufacture and inspection, etc.

4 The pump data sheet shall list out the data necessary for pump design, selection and inquiry, including medium name, operating condition, site condition, explosion-proof grade, construction parameter, principal material, type of drive, flushing, mechanical seal, inspection and acceptance, scope of supply, nozzle flange parameter, etc.

5 The data sheet of special valves shall list out the series number of equipment or pipe under protection, service condition, type of valve, valve materials, pressure rating, flowrate, constant pressure, back pressure and allowable overpressure, etc.

6 The data sheet of other small equipment shall list out the operating parameters, design

parameters, construction parameters, medium name, nozzle flange parameters and thermal insulation, etc.

2.2.8 The equipment specifications shall list out the long-lead equipment's main process parameters, structural form, pressure rating, material of construction, normative reference, scope of supply, inspection and acceptance, packing and transportation, quality insurance and field service, vendor document return, etc.

2.2.9 The process flow diagram shall show the complete process, including name of main process equipment, tag number, operating temperature, operating pressure, specification, safety relief and vacuum-resistance measures as well as nominal diameter of main process pipe, medium flowrate, operating temperature, operating pressure, control valve, flowrate control and metering, etc.

2.2.10 The utilities flow diagram shall be plotted on the material category basis to indicate the source of material and equipment handling the material, including the equipment name, tag number, nominal diameter of stream pipe, medium flowrate, operating temperature, operating pressure, control valve, flowrate control and metering, etc.

2.2.11 Piping & instrument diagram(P&ID)shall show the following:

1 Following shall be show for the equipment:

1) Tag number, name and type of all equipment, as well as the specifications, heating and thermal insulation requirements, etc.

2) Description on equipment safety relief, vacuum-resistance measures and safety accessories shall indicate the size, parameter and number of safety valve, rupture disc, breathing valve, relief valve, nitrogen sealing valve, etc.

3) Scope of supply of package equipment.

2 Following shall be show for the pipe:

1) All process pipes connecting to the equipment, the medium flow direction, medium code, pipe number, nominal diameter, pipe class, pipe spec break, heat tracing and thermal insulation requirements, etc.

2) The process-related valves and those installed for process requirements; Tag number of automatic control valve.

3) All safety relief and vacuum-resistance measures, including safety valve, rupture disc, reducing valve and relief valve as well as their tag numbers, etc.

4) Main pipe attachments, including metal hose, filter, restriction orifice plate and blind, etc.

3 Following shall be show for the instrumentation:

1) Measuring instruments as well as complete set of instrument and control valve wired to the control system, plus their tag numbers.

2) Control and interlock relation.

2.2.12 The utility pipe & instrument diagram shall show the following:

1 Tag number and name of equipment transferring utilities medium.

2 Pipe medium flow direction, medium code, pipe number, nominal diameter, pipe class, pipe spec break, thermal insulation and heat tracing requirements, valves, etc.

3 Separately number the measuring instruments as well as complete set of instrument and control valves wired to the control system.

2.2.13 The legends and symbols in the process flow diagram, utility flow diagram, piping & instrument

diagram(P&ID), utility piping & instrument diagram(U&ID)shall show the following:

1 Meaning of symbol, abbreviation and designation of equipment, pipe and instrument.

2 Specifications of assigning the legend and designation of equipment, pipe and instrument.

2.3 Piping

2.3.1 The basic engineering design documents for the piping section shall consist of the following:

1 Description;

2 Design specifications;

3 Bill of materials;

4 Piping and equipment layout.

2.3.2 The content of description shall describe the following requirements:

1 Design principles shall include the applicable national project construction regulations, policies and requirements, state-of-the-art material selection principles, supporting conditions for project construction, etc.

2 Design scope shall clearly describe the division of process unit(main item)and the main work of project.

3 Design scheme shall describe the piping and equipment layout, pipe thermal insulation and heat tracing, pipe corrosion protection and cathodic protection and piping stress design scheme.

4 Pipe components selection shall include the requirements on selection of pipe, pipe fittings, connectors and valves, etc.

5 The safety measures shall describe the safety measures adopted in the design.

6 The names and serial numbers shall be clearly indicated for the applicable standards.

7 In the existing problems and suggestions, the following shall be described such as the holding piping and equipment layout, supporting conditions and suggestions.

2.3.3 The content of design specifications shall describe the following requirements:

1 Design specifications on equipment layout shall include the following:

1)Applicable standards for layout;

2)Equipment layout principles;

3)Road width and space requirements;

4)Setup principles for pipe sleepers, pipe racks and buildings(special structures);

5)Foundation elevation requirements;

6)Setup requirements for platforms & ladders;

7)Routing requirements for opower cables and instrument cables;

8)Equipment and pump maintenance requirements;

9)Environmental protection requirements;

10) Design requirements foro ccupational disease protection facilities.

2 Piping layout design specifications shall include the following:

1)Applicable standards on piping layout;

2)General requirements on piping layout;

3)Pipe purging requirements;

4)Pipe drain and vent requirements;

5)Pipe heat tracing and drain requirements;

6)Pressure-relief pipe installation requirements;

7)Pipe spacing requirements;

8)Pipe gradient requirements;

9)Pipe burial depth requirements;

10)Valve installation requirements;

11)Instrument element installation requirements;

12)Safety valve installation requirements;

13)Design requirements for piping supports and hangers;

14)Pipe protective sleeve design requirements.

3 Design specifications of pipe materials shall include the following:

1)Main pipe components selection standards;

2)Pipe components selection principles;

3)Requirements on name, nominal diameter, pressure rating, material of construction, end face type, wall thickness and standard of pipe, pipe fittings, flange, gasket, bolt, nut, valve, as well as valve internals material and type.

4 Design specifications of pipe thermal insulation shall include the following:

1)Design principles on pipe heat insulation, cold insulation and anti-scalding;

2)Specifications on selection of thermal insulation material, calculation on thickness of thermal insulation layer, and design, construction and acceptance of thermal insulation structure.

5 Design specifications of pipe painting shall include the pipe surface pretreatment requirements, design, construction and acceptance requirements of corrosion protection painting and corrosion protection coating and requirements on pipe surface color and mark, etc.

6 Design specifications of pipe mechanical shall include the following:

1)Pipe flexibility design specifications;

2)Stress analysis calculation basis and application software;

3)The applicable codes and standards on seismic fortification intensity, seismic design for the project site and seismic design specifications for the non-buried pipe.

2.3.4 The content of bill of materials shall meet the following requirements:

1 The list of pipe equipment materials shall list out all types of valves used in the project, as well as the valve's nominal diameter, pressure rating, technical requirements, quantity and standard etc. based upon the valve type.

2 The list of pipe materials shall list out the size, technical requirements, quantity and weight of pipe, thermal insulation material and anti-corrosion material, etc.

3 The list of equipment materials shall list out the name, specification, material of construction, technical requirements, unit and quantity of all types of small process equipment and accessories, etc.

2.3.5 The layout of pipe and equipment shall show the following:

1 Battery limit and coordinate.

2 Location or coordinate of dike, intermediate dike and weir.

3 Contour and relative location between equipment and buildings (special structures), relative location between pipe corridor, locating dimension of equipment and buildings (special structures).

4 Arrangement of pipe sleeper and pipe rack as well as width and gradient of pipe sleeper.

5 Equipment tag number and name.

6 Location and dimension of control room, substation and auxiliary room within the battery limit as well as the relative elevation of indoor ground.

7 Bill of main equipment.

8 Description of dimension and coordinate unit.

9 Construction north.

2.4 Equipment

2.4.1 The basic engineering design documents for the equipment section shall consist of the following:

1 Description;

2 Design specifications;

3 Equipment engineering drawing.

2.4.2 The content of description shall describe the following requirements:

1 The overview shall describe equipment type, quantity and specifications;

2 Equipment summary shall include the summary of equipment and main accessories;

3 The equipment structural characteristics shall include structural descriptions of storage tank, spherical tank, vessel, heat exchanger, etc.;

4 The names of lead materials and main accessories imported or home-made, and scope of supply shall be clearly described.

2.4.3 Design specifications shall include specifications of vertical cylindrical storage tank, spherical storage tank, vessel and heat exchanger based on the equipment type and complying with the following:

1 Besides fundamental wind pressure, seismic fortification intensity, reference snow pressure, field soil classification and ground roughness, other necessary ambient conditions shall be included for equipment calculation and material selection. The lowest daily average temperature for years since meteorological records begin shall be included for storage tank design. The hourly max. precipitation shall also be included for the floating roof storage tank design. The min. monthly average temperature for years shall also be included for the design of storage pressure vessel in which the metal shell temperature is vulnerable to the atmospheric temperature impact, including spherical tank.

2 The names and serial numbers shall be clearly indicated for the applicable standards.

3 The lead material and design calculation shall include the selection of lead material and design calculation requirements.

4 The design pressure and temperature shall include determination principles.

5 Manufacturing and inspection shall include the applicable manufacturing & inspection standards and design requirements.

6 Corrosion protection design shall include the corrosion protection measures and locations, etc.

7 The selection of thermal insulation materials, requirements of performance and outer protective layer, etc. shall be described.

8 Accessory selection shall include the flange standard and type, primary and secondary seal type, drainage type, agitation and location limit type, roof type of tanks, etc.

9 Other requirements shall include transportation requirements as well as special requirements on structure, material, accessory, etc.

2.4.4 The content of equipment engineering drawing shall include the design condition description, schematic diagram, equipment type, overall dimension, lead material, main opening, attachment type and

quantity, main material, part quality and total quality, etc. The following equipment shall have the engineering drawings.

1 In the vertical cylindrical storage tanks, floating roof storage tanks with nominal volume of more than or equal to 10000m^3, internal floating roof storage tanks with nominal volume of more than or equal to 1000m^3, fixed roof storage tanks with nominal volume of more than or equal to 1000m^3, stainless steel storage tanks with nominal volume of more than or equal to 500m^3, low-pressure storage tanks with design pressure of higher than or equal to 2000Pa and cryogenic storage tanks.

2 Spherical storage tank.

3 Class Ⅲ pressure vessel.

4 Other equipment with special requirements.

2.5 General plot plan and transportation

2.5.1 The basic engineering design documents for general plot plan and transportation section shall consist of the following:

1 Description;

2 Design specifications;

3 List of equipment for transportation and handling;

4 Bill of materials;

5 Regional location plan of oil depot;

6 Overall plot plan of oil depot;

7 Elevation layout of oil depot;

8 Road and rain water drainage layout in oil depot;

9 Earthwork drawing;

10 Unit(main item)elevation layout plan.

2.5.2 The content of description shall describe the following requirements.

1 The overview shall describe the following:

1)The existing and planning neighboring enterprises or facilities associated with the project around the oil depot as well as the existing river, etc.;

2)Existing traffic and transportation conditions;

3)Total required area of oil depot, type of land used, land requisition and demolition of buildings (special structures)and residential area;

4)Topography and landform, engineering geology, hydrological data, meteorological condition, seismic intensity and other natural conditions in the site of oil depot.

2 Design scope shall describe the design scope of project and main works of project.

3 The overall plot plan shall describe the following:

1)Overall plot plan principles of oil depot;

2)Overall plot plan shall describe division of functional zones, content of each functional zone, respective location relationship of each functional zone and reserved land in the oil depot, distribution of oil depot fence, gate and guard house, arrangement of reserved land, etc.;

3)Layout of main pipe network in oil depot and the pipe connections in battery limit of oil depot;

4)Overall plot plan shall coordinate with urban and industrial district planning, as well as meet the health protection and fire separation distance requirements;

5) Fire-spacing-distance between respective facilities in oil depot.

4 The elevation layout shall describe the following:

1) Elevation layout principles;

2) Elevation layout design, design elevation, design gradient and slope direction. For the terrace layout case, the connection of the terraces, type and material of retaining wall, type and material of the slope protection shall be specified;

3) In the way of rain water drainage in oil depot and the type of ditch structure, the section type, material, width and longitudinal slope at the bottom shall be described;

4) Earthwork volume and the treatment of surplus and deficiency of earth;

5) The elevation design for oil depot shall describe the flood control and discharge requirements.

5 The road in oil depot shall describe if the road types and distributions may meet the requirements for transportation, fire-fighting and maintenance. The road type shall also describe the road width, gradient, turning radius, space, structural material and engineering practice.

6 Transportation shall describe the following:

1) Total cargo throughput, transportation scheme, proportion of different modes of transportation and undertaking transportation volume. The list of transportation volume, mode of transportation and configuration of conveyances are shown as Table 2.5.2-1 and Table 2.5.2-2 for details;

Table 2.5.2-1 List of transportation volume and mode

S/N	Cargo	Transportation volume and mode(t/a)					Sub-total	Remark
		Railway	Road	Pipe	Ship transport	Others		
Delivery in								
1								
…								
Sub-total of delivery in								
Delivery out								
1	…							
…								
Sub-total of delivery out								

Table 2.5.2-2 List of configuration of conveyances

S/N	Description	Model	Unit	Q'ty	Remark
1	…				
…					

2) The transportation volume railway, track-connecting point for special railline, way and location of docking, way of placing-in and taking-out wagon, self-owned locomotive, tank car disposition principles and quantity, quantity of rail lines in oil depot, rail lines arrangement, railway length, etc.;

3) The transportation volume by highway, truck disposition principles and quantity;

4) The transportation volume by ship, jetty location as well as the relation with the oil depot;

5) The transportation volume through pipelines, the location of pipelines in and out of oil depot.

7 Landscaping shall describe landscaping planning principles and landscaping specifications in the oil depot.

8 The engineering quantities shall list out the bill of quantities of the general plot plan and transportation design.

9 The main tech-economic indicators shall be described as in Table 2.5.2-3.

Table 2.5.2-3 List of main tech-economic indicators

S/N	Items	Unit	Quantity	Remark
1	Site area for oil depot, including	ha		
	Site area for storage tank farm	ha		
	Site area for loading & unloading facilities	ha		
	Site area for auxiliary facilities	ha		
	Site area for administrative facilities	ha		
	Site area for reserved land	ha		
	Site area for access and other aspects	ha		
2	Land use coefficient for storage tank farm	%		
3	Land use coefficient for loading & unloading facilities	%		
4	Length of road in oil depot	km		
5	Oil depot road coefficient	m/ha		
6	Railway length	km		
7	Site area for oil depot landscaping	ha		
8	landscaping coefficient in oil depot	%		
9	Earthwork volume, including	m^3		
	Excavation volume	m^3		
	Landfilling volume	m^3		
10	Site preparation earthwork coefficient for oil depot	m^3/m^2		

10 The names and serial numbers shall be clearly indicated for the applicable standards.

11 In the existing problems and suggestions, the holding problems, further improvement and recommendations shall be described.

2.5.3 The content of design specifications shall describe the following requirements.

1 The general provisions shall include the scope of application and scope of design.

2 The design principles shall include the following:

1) Overall plot plan principles;

2) Elevation layout principles;

3) Road and railway design principles;

4) Oil depot rainwater drainage and flood control and discharge design principles;

5) Truck, forklift, locomotive and railcar disposition principles;

6) Design principles of oil depot's fence, gate and guard house;

7) Design principles of landscaping planning in oil depot.

3 General requirements shall include the following:

1) Coordinate system used for the project and conversion formula used for different coordinate systems;

2) Elevation system used for the project and conversion between different elevation-systems;

3)Road type, road width, road longitudinal slope, road transverse slope, road turning radius, structural material and engineering practice, curb dimension;

4)Class of special railway, type of traction, limit slope, min. radius of curve, width of subgrade, cross slope of subgrade and way of rain drainage, type of rail, standard, min. height, model of turnout, telecom, type of signal, type of car bumper, type of lighting, and width & height of loading & unloading platform;

5)Structural material and engineering practice for ground paving, unit's ramp and pavement;

6)Material and engineering practice of open ditch, culvert, cut-off ditch and flood discharge ditch.

4 The names and serial number shall be clearly indicated for the applicable standards.

2.5.4 The list of transportation loading & unloading equipment shall list out name, model and size, quantity of locomotive, trains, various trucks, loading & unloading and lifting equipment, forklift, track and truck scales, etc.

2.5.5 Bill of material shall indicate the name, type and specification, quantity of the material, etc.

2.5.6 Regional location plan of oil depot shall show the following:

1 Wind rose, legend, description, etc.

2 The locations of existing and planned adjacent plants or facilities related to the project.

3 Location and battery limit between the oil depot and offsite supporting facilities.

4 Route and location of railway, highway, HV transmission line, water supply and drainage pipeline, process pipeline, heating pipeline, flood's drainage ditch, drainage ditch in and out of the oil depot.

5 The road, pipe gallery and other routes between the oil depot and the jetty.

2.5.7 Overall plot plan of oil depot should show the following:

1 Measurement coordinate grid, building coordinate grid, wind rose, legend and description, etc.

2 Natural landform, topography or existing map.

3 Location and coordinate of battery limit, fence, gate and guard house for oil depot land; location and coordinate of oil depot road, as well as entrance and exit; location and coordinate of railway, retaining wall, revetment and flood's drainage ditch in oil depot.

4 Layout of battery limit and coordinate of each facility as well as that of main equipment and building(special structure)within the facility.

5 Location and coordinate of rail line, metering facilities and transportation loading & unloading facilities. The coordinates of battery limit rail lines inside and outside the oil depot.

6 Fire and safety protection spacing with the main neighboring facilities.

7 Routing of main pipe network in oil depot.

2.5.8 Elevation layout of oil depot shall show the following:

1 Construction north, legend, description and bill of quantities, etc.

2 Location, coordinate and elevation of control point of oil depot fence, gate and guard house, battery limit for each facility, road, railway, retaining wall, revetment, etc.

3 Name of each facilities and main buildings(special structure).

4 Design elevation or slope direction of oil depot and each facility as well as indoor and outdoor floor elevation for main buildings.

5 Final design elevation of the oil depot ground.

2.5.9 Road and drainage layout of oil depot should show the following:

1 Construction north, legend, description and bill of quantities, etc.

2 Plan position of oil depot fence, gate and guard room; battery limit, name and coordinate of each facility. Layout and coordinate of railway line, metering facility and loading & unloading facilities, etc.

3 Road plan position and center coordinate, width of subgrade, subgrade design elevation at road junction and gradient change point, slope direction, gradient and slope length of road longitudinal slope, location of grade crossing, square and turnaround. Location of rain ditch, bridge culvert, torrent gutter and hydraulic drop facility, and the width, gradient and slope direction of drainage ditch, ditch length, ditch bottom elevation at the starting and ending points.

4 Sectional drawing of road, ditch, etc.

2.5.10 The earthwork drawing shall show the appropriate diagrams as below.

1 When the grid calculation method is adopted, the earthwork drawing shall show the following:

1) Construction north, legend and description;

2) Location of site preparation scope line, battery limit for each facility, fence gate and site road;

3) The grid chart should be plotted with the grid of 20m×20m or 40m×40m, and the elevation of natural ground, design elevation and construction height are indicated at each corner of grid chart;

4) Plot the fill and excavation battery limit, calculate the earthwork volume in the grid and summarize the total amount of fill and excavation.

2 For the earthwork calculation with section method, the earthwork drawing shall show the following:

1) Define the location of selected section and number it in the site preparation drawing;

2) Plot the natural ground line and design ground line in the sectional drawing, and calculate the section area of fill and excavation;

3) Calculate the total amount of fill and excavation based on the fill and excavation areas of each section as well as the distance between each section.

2.5.11 The unit (main item) elevation layout plan shall show the following:

1 Construction north, legend, description and bill of quantities, etc.

2 Location of unit (main item) battery limit and the layout of equipment and building (special structure) within the battery limit.

3 Coordinate of unit (main item) battery limit.

4 Design elevation and slope direction. The elevation layout of an individual building shall also indicate the indoor ground elevation.

5 Driveway/sidewalk paving, side walk and turnaround loop location, turning radius and dimension. Rain ditch location, width, gradient, slope direction, ditch length, elevation of bottom of trench at the starting and ending points. Fire dike and intermediate dike locations, coordinate and dike crest elevation. Locations of culvert, crossover ladder, crossover bridge, oil-interception drain valve, catch pit, etc.

6 The ground design elevation and slope direction outside of the unit (main item) battery limit. Section ramp location, coordinate, road width, turning radius, road design elevation at the intersection and gradient change point, ramp longitudinal slope direction, gradient and slope length.

2.6 Instrumention & control

2.6.1 The basic engineering design for instrumention & control section shall consist of the following:

1 Description;

2 Design specification;

3 Instrument index;

4 Instrument specification;

5 Instrument panel(cabinet)specification;

6 On-line analyzer specification;

7 Bill of materials;

8 Instrument list;

9 Central control room(CCR)layout;

10 Flammable and toxic gas detector layout;

11 Instrument main cable tray or routing;

12 Interlock diagrams;

13 Sequential control logic(time sequence)diagram;

14 Complex loop control diagrams(description).

2.6.2 The specifications shall be provided when distributed control system(DCS), safety instrumented system(SIS), programmable logic control(PLC)system and supervisory control and data acquisition (SCADA)system are applied.

2.6.3 The content of description shall describe the following requirements:

1 In the section of process, the process automatic control level, flowmeter design as well as accuracy shall be described.

2 In the section of measurement and process control philosophy, the special instrument, sequence control and safety instrument system, etc. shall be briefly described.

3 In the section of the main instrument selection and process control system function and hardware configuration, the size and quantity of operating console, printer, auxillary console, instrument panel and cabinet, etc. shall be specified.

4 In the section of the safety instrumented system and gas detection system, explosion-proof, flammable and toxic gas detector, etc. shall be specified.

5 In the section of Instrument protection, the following shall be specified such as explosion-proof, thermal insulation, clogging prevention, corrosion protection, grounding, lightning protection, electromagnetic compatibility and radiation protection, etc.

6 In the section of layout of control room and field cabinet room, the size and layout including auxiliary facilities shall be specified.

7 In the section of utility feeder and consumption, instrument power supply, instrument air and heat tracing shall be specified.

8 The scope for package instrument and control system shall be specified for the instruments supplied with the equipment.

2.6.4 The content of design specifications shall comply with the following requirements:

1 The general provisions shall describe the scope of application and design.

2 The names and serial numbers shall be clearly indicated for the applicable standards.

3 Instrument signal transmission and units of measurement shall be specified in the design basis.

4 The selection principle of instrument and control system shall be described, and for control system, DCS, PLC, SCADA, SIS, etc. should be included. For field instruments, temperature instruments, pressure instruments, flow instruments, level instruments, control valves and on-off valves, analyzers and other instruments should be included where applicable.

5 The following specifications of field instruments including ingress protection, explosion-proof, electromagnetic compatibility, grounding and lightning protection, etc. shall be specified.

6 The requirement of instrument power supply, air supply and heat (cooling) supply, etc. shall be specified for instrument power supply. The source, voltage, frequency, capacity, spare capacity and terms, uninterrupted power supply (UPS), etc. should be included. For instrument air supply, the pressure, mass, dew point temperature, air consumption and spare capacity, etc. should be included. The instrument heating (cooling) sources should include the type, temperature, pressure and consumption, etc.

7 The requirements for control room layout, area, architecture, structure, heating, ventilation and air conditioning (HVAC), lighting, etc. shall be specified. The control room should consist of operating room, engineer station, cabinet room as well as field auxiliary room, UPS room, HVAC room, shift change room, locker room and toilet, etc.

8 The principles for selection of wire (cable), instrument cable tray, instrument impulse lines, instrument air lines, heat tracing lines, valves, fittings and thermal insulation materials, etc. shall be specified in the bill of materials.

2.6.5 Instrument index shall consist of all the instruments and auxiliary instruments for indication and control loop including tag number, service, instrument type, signal transmission type, instrument specification, specification number, installation location, P&ID number and piping or equipment number, shall be in the sequence of P&ID, U&ID and the alphabetical order of measured variables, or in the other agreed sequence order.

2.6.6 The instrument specification shall specify the specifications and data of all instruments according to the instrument type, in which the instrument tag number, name, service, process operating condition, quantity, protection and explosion-proof grade, type, scope of measurement, accuracy, signal transmission type, power supply, process connection and electrical connection, etc. shall be included. The instrument specification should also provide the P&ID number, location, piping or equipment number and pipe class. For the on-line process analyzers, the instrument specification shall also provide the compositions of process stream and background gas, process operating and utility conditions, technical specification and attachments.

2.6.7 The instrument panel (cabinet) specification shall include the overall size, quantity, technical requirements of instrument panel (cabinet) including its attachments.

2.6.8 The on-line process analyzer room specification shall include requirements for analyzers and instruments installed in the room and other facilities within analyzer packages scope such as pre-sample conditioning system, sample conditioning system, vent system, sample recovery system, utility and electrical wiring, etc.

2.6.9 Bill of materials shall include all necessary main materials used for instrument installation, including the type, specifications and quantity of steel, wire (cable), impulse lines, air lines, heat tracing lines, conduits, valves, fittings, junction box, instrument box with or without insulation and

cable tray, etc.

2.6.10 Instrument list shall include the name, specifications and quantity of all instruments and control systems.

2.6.11 DCS specification shall specify the general requirements for system, hardware and basic software requirements, etc., which should provide the specification and configuration requirements for controller, input/output(I/O)card, operation console, printer, communication system. Scope of supply, I/O type and quantity, system redundancy and standby, spare parts, communication interface, configuration software description, application software description, networking and data access requirements should also be specified.

2.6.12 SIS specification shall specify the general requirements for system, hardware configuration and basic software requirements, etc., which should provide the specifications and configuration requirements for PLC, I/O card, monitoring station (including auxiliary console), printer, communication system, configuration and programming terminal, sequence event recorder, etc., Scope of supply, I/O type and quantity, system redundancy and standby, spare parts, communication interface, configuration software description, application software description, networking and data access requirements, safety instrument system logic diagram or interlock logic block diagram should also be specified.

2.6.13 PLC specification shall specify the general requirements for system, hardware configuration and basic software requirements, etc; which should provide the technical specification and configuration requirements for central processing unit, I/O card, operation console, printer, programming terminal, communication interface. Scope of supply, I/O type and quantity, system redundancy and standby, spare parts and programming software requirements should also be specified.

2.6.14 SCADA specification shall specify the general requirements for system, hardware configuration and basic software requirements, etc. which should provide the specifications and configuration requirements for central processing unit, remote data acquisition unit, I/O card, operation console, printer, communication system, etc. Scope of supply, I/O type and quantity, system redundancy and standby, spare parts, communication interface and configuration software description should also be specified.

2.6.15 DCS specification, SIS specification, PLC specification and SCADA specification shall specify the requirements for the vendors including engineering service, training, configuration, test and acceptance, commissioning service, quality assurance and project hand-over documents, etc.

2.6.16 The control room composition, dimension, floor elevation and locations of cabinet, terminal cabinet, power cabinet, operation console, printer and auxiliary console, etc. shall be shown in the control room layout.

2.6.17 Detector tag number, location and installation elevation, etc. shall be specified in the flammable and toxic gas detector layout.

2.6.18 The relative location of control room and each unit, the main cable tray routing, elevation and dimension shall be specified in the Instrument cable tray routing.

2.6.19 Cause and effect between input and output shall be specified in interlock diagrams.

2.6.20 During the sequence process control, operating status and logic relations between involved equipments shall be specified in the sequence control logic(time sequence)diagram.

2.6.21 Complex loop control philosophy and composition shall be specified in complex loop control

diagrams(description).

2.7 Electrical

2.7.1 The basic engineering design documents for the electrical section should consist of the following:

1 Description;

2 Design specifications;

3 Calculation sheet;

4 List of electrical loads;

5 Bill of equipment and materials;

6 Equipment specification;

7 Overall key single line diagram in oil depot;

8 Topology diagram of SCADA system;

9 Classification of hazardous area in oil depot;

10 Cable routing in oil depot;

11 Lightning protection and grounding layout in oil depot;

12 Single line diagram;

13 Equipment layout of substation.

2.7.2 The content of description shall describe the following requirements:

1 The overview shall describe the scope of design, load classification, power requirements, total electric loads, annual power consumption, emergency load, emergency power supply, classifications of explosion risk materials, etc.

2 The section of power supply and distribution engineering should describe the external power supply and power line parameters, the connections of feeders and operation, arrangement of automatic unit and operation, energy-saving measures, substation arrangement and scope of power supply, process interlock and special control requirements, cable selection and cabling, etc.

3 Lighting should describe the lighting kinds, power supply, control and cabling requirement.

4 The lightning protection, anti-electrostatic and grounding should describe the classification of structures to be protected against lightning, anti-electrostatic measures, grounding type and required grounding resistance.

5 Electrical maintenance and repair should describe the availability of supports.

6 In the existing problems and suggestions, the holding supporting conditions and those which need optimization shall be described.

2.7.3 The content of design specifications shall comply with the following requirements:

1 Design basis shall describe the power data, relative agreement, minutes of meeting, meteorological and geological information.

2 The names and serial numbers shall be clearly indicated for the applicable standards.

3 The power supply and distribution system should describe the substation power system, relay protection, power distribution and monitoring system, reactive power compensation, substation layout, cabling and equipment selection and installation, the relative disciplines' requirement on substation.

4 The lighting design should describe the design principles, equipment selection and installation requirements.

5 The section of lightning protection, anti-electrostatic and grounding design should describe the

lightning protection, anti-electrostatic, grounding design principle, equipment selection and installation requirements.

2.7.4 The calculation sheet shall list out the methods, conditions, input data and output results of calculation, and should analyze the calculation results. Electrical calculation should cover the load, transformer selection, emergency load, reactive power compensation, short-circuit current, electrical equipment selection, voltage deviation during the motor start and restart, capacitance current, power cable size selection, depot road lighting and other calculations.

2.7.5 The list of electrical loads shall list out the name, rated voltage, rated capacity, calculated capacity, annual power consumption, installed capacity and the quantities of running equipment. The load summary shall describe the total installed capacity, the calculated capacity and all electrical capacity in the oil depot.

2.7.6 The bill of the equipment and materials may be listed out based on the catalog of power distribution, cabling, lighting, lightning protection and grounding. It should describe the name, type, specification, unit, quantity, remarks, etc.

2.7.7 Specifications of equipment shall list out the main power supply equipment in substations, and should include the scope of application, seller's responsibility, applicable codes and standards, technical requirements of design, requirements of testing, inspection and corrosion protection, name plate or marks and seller's documents, etc.

2.7.8 The single line diagram in the oil depot should show the related parameters of outer feeders, the substations arrangement and their electrical relations, the data of the main electrical equipment, the substation's power supply scope and load.

2.7.9 Schematic diagram of SCADA system should show the equipment arrangement and telecommunication relations among the master station and the sub-stations. It should also indicate the telecommunication relations of the SCADA system of the oil depot and the external environment.

2.7.10 Classification of hazardous area in explosive gas atmosphere should be shown in plot plan layout. The typical and section view may be used if necessary. The parameters of explosive materials, the process operating conditions, the minimum requirement of electrical equipment and its explosion-proof certification should be described in the drawing.

2.7.11 The cabling drawing shall show the main cable route and installation in the oil depot.

2.7.12 The drawing of lightning protection and grounding layout in oil depot should show the layout of the grounding grids, the relationship between different grounding systems and requirements for grounding resistance, the design of eletro-static grounding and practice in oil depot.

2.7.13 Single line diagram should show the bus connection, relay protection design, and automatic unit arrangement. Metering, measuring, design of meters, electric power parameters, design of compensation unit and power distribution circuits should be indicated.

2.7.14 Substation equipment layout shall show the substation structure and size, location and dimension of substation equipment arrangement, and location and dimension of safety exit.

2.8 Telecommunication

2.8.1 The basic engineering design documents for the telecommunication section should consist of the following:

1 Description;

2 Design specifications;

3 Bill of equipment and materials;

4 Equipment specifications;

5 Telephone wiring system diagram or structured cabling system diagram;

6 Wireless communication system diagram;

7 Automatic fire alarm and fire-fighting control system diagram;

8 Public address system diagram;

9 Television monitoring system diagram;

10 Intelligent card system diagram;

11 Perimeter alarm system diagram;

12 Telecommunication equipment configuration diagram.

2.8.2 The content of description shall describe the following requirements:

1 Design scope shall describe the design scope of project and main works of project.

2 The content of telecommunication system shall comply with the following requirements:

1) The administration telephone, dispatch telephone and direct-dial telephone system shall describe the type of telephone, design scheme of telephone station, mode of relay, power supply and grounding, etc.;

2) The structured cabling system shall clearly describe the system scheme, composition, function and information socket installation location;

3) The wireless telecommunication system shall clearly describe the system scheme, composition, working way, characteristics of user's location and frequency of use and power;

4) The automatic fire alarm and fire-fighting control systems shall describe the system scheme, composition, function, controller, fire console or PLC control cabinet mounting locations, mounting location of different alarm devices, integrated fire-fighting control logic relation, networking telecommunication, alarm device and emergency broadcasting schemes;

5) The public address system shall describe the system scheme, composition, function, capacity, loop quantity, way of power supply, installation location of host computer, intercom station, loudspeaker mounting location and connection relation with other systems;

6) The television monitoring system shall clearly describe the system scheme, composition, function, way of signal transmission, ways of power supply, objects monitored by the camera, the mounting locations of monitor, controller and console, and connections with other systems;

7) The intelligent card system shall describe the system scheme, composition, function, mounting locations of card reader and controller and signal transmission mode;

8) The perimeter alarm system shall describe the system scheme, composition, function, mounting location of detector and controller and signal transmission mode;

9) The type of telecommunication line, cable and fiber optic cable selections, route selection and way of cabling, etc. shall be described for telecommunication lines;

10) The list of telecommunication users shall show the mounting location, name and quantity of user equipment, environmental characteristics, etc. The list of telecommunication users should comply with the requirements of Table 2.8.2.

Table 2.8.2 List of telecommunication users

S/N	Unit number	Unit/room name	Administration telephone	Direct-dialing telephone	Dispatch telephone	LAN terminal	Wireless telephone	Television monitoring, communication system			Fire alarm and fire-fighting control system					Public address system		Environmental characteristics	Remarks
								Detector	Camera	Monitor	Manual alarm	Flame detector	Smoke and temperature detector	Alarm unit	Control/display	Intercom station	Loudspeaker		
1																			
2																			
		Total																	

2.8.3 The content of design specifications shall comply with the following requirements:

1 General provisions shall describe the scope of design and scope of application.

2 Design basis shall describe the supporting telecommunication conditions and meteorological conditions, etc.

3 The names and serial numbers shall be listed for the main applicable standards.

4 The content of telecommunication system shall comply with the following requirements:

1) The administration telephone system shall describe the system scheme, telephone station capacity and function configuration, mode of relay, numbering plan, principle on selection of auxiliary equipment in the telephone station, telephone station process requirements, wiring design, power supply, lightning protection and grounding, etc.;

2) The dispatch telephone system shall describe the system scheme, telephone station capacity and function configuration, power supply, lightning protection and grounding, etc.;

3) The structured cabling system shall describe the system solution, composition, function, cable selection and cabling, etc.;

4) The wireless telecommunication system shall describe the system scheme, composition, function, base station, antenna, vehicle-locating set, radio setup principle, power supply, lightning protection and grounding, etc.;

5) The automatic fire alarm and fire-fighting control system shall describe the system scheme, composition, function, fire alarm controller, fire console or PLC control cabinet, setup principles of fire alarm field equipment, mode of transmission, cable selection and cabling, power supply, lightning protection and grounding, etc.;

6) The public address system shall describe the system scheme, composition, function, setup principles of intercom station and loudspeaker, mode of transmission, cable selection and cabling, power supply, lightning protection and grounding, etc.;

7) The television monitoring system shall describe the system scheme, composition, function, camera, monitoring equipment setup principles, mode of transmission, cable selection and cabling, power supply, lightning protection and grounding, etc.;

8) The intelligent card system describe the system scheme, composition, function, set-up scheme of card reader and monitoring equipment, mode of transmission, cable selection and cabling, power supply, lightning protection and grounding, etc.;

9) The perimeter alarm system describe the system scheme, composition, function and detector and monitoring equipment setup principle, mode of transmission, cable selection and cabling, power supply, lightning protection and grounding, etc.;

10) The telecommunication line shall describe the general requirement, line routing and indoor wiring, etc.

2.8.4 The bill of equipment and materials shall list out the name, specification, parameter and quantity of main equipment and materials.

2.8.5 The equipment specifications shall list out equipment function, technical parameters, IP class, power supply requirements and type of interface, etc.

2.8.6 All system diagrams should show the system compositions, equipment name and quantity, equipment installation location, connectionrelatation between equipment as well as networking relation with different systems, etc.

2.8.7 The telecommunication equipment configuration diagram shall show the installation location,

quantity of main telecommunication equipment and user terminals in the plan view.

2.9 Architecture

2.9.1 The basic engineering design documents for the building section shall consist of the following:

1 Description;

2 Design specification;

3 List of buildings;

4 Building plot plan;

5 Building elevation drawing;

6 Building section drawing.

2.9.2 The content of description shall describe the following requirements:

1 Design principle shall include the principles of implementing the applicable national project construction regulations, policies and requirements, state-of-the-art material selection principles and project construction supporting conditions, etc.

2 Design scope shall describe the design scope of the project and main works of project.

3 Design basis shall describe the utilities conditions, meteorological conditions and seismic fortification classification, etc.

4 The building design schemes shall describe the concept and feature, quantity of of building storeys, structure selection, function zoning and traffic management, etc.

5 The process characteristics shall describe the technical requirements on the building, including fire protection, anti-explosion, explosion-proof, corrosion protection, sound insulation, lighting and ventilation, etc.

6 The section of technical indicators and parameters shall describe the total area, floor space, quantity of of building storeys, floor height and total building height, etc.

7 The building's energy-saving measures shall describe the energy-saving measures adopted in production management and auxiliary production facilities.

8 For the revamping and expansion projects, the utilization of existing buildings shall be described.

2.9.3 The content of design specifications shall describe the following requirements:

1 The names and serial numbers shall be clearly indicated for the applicable standards;

2 Design principle shall describe the building type, fireproof rating, roof waterproof grade and building energy-saving requirements;

3 For buildings with special requirements, the proposed technical measures such as fire protection, anti-explosion, explosion-proof, corrosion protection, sound insulation, lighting and ventilation, etc. shall be described;

4 The specifications of material selection and engineering practice shall describe the wall, floor, roof, door/window, internal and external wall decoration, etc.

2.9.4 The list of buildings shall list out the classification of fire hazards, fire-resistance rating, building floor space, building area, building structure type, foundation, enclosure structure, floor, roof, door/window, etc., and shall describe the special requirements of process characteristics on the buildings. The content of the list of buildings shall comply with the requirements of Table 2.9.4.

2.9.5 The building plot plan shall show the column grid axis dimensions, building overall dimensions, location of rooms at each floor, room name, envelope enclosure material, wall thickness and door/window location, as well as the section line and number, building orientation, etc.

Table 2.9.4 List of buildings

S/N	Building	Safety class of structure	Seismic fortification category	Classification of fire hazards	Fire-resistance rating	Roof water-proof grade	Building floor space (m^2)	Building area (m^2)	Reasonable service life	Building characteristics						Three materials			Remark
										Structural type	Foundation	Envelope enclosure	Floor	Roof	Door/ window	Steel (t)	Wood (m^3)	Cement (t)	
1																			
2																			
3																			
4																			
5																			
…																			
	Total	—	—	—	—	—				—	—	—	—	—	—				

2.9.6 The building elevation layout shall show the type of door/window, outdoor staircase, ladder for maintenance, canopy, balcony, storm sewer and stack, as well as the ground elevation at each floor, total height and axis number at both ends, etc.

2.9.7 The building section drawing shall show the segmented and visible internal structure and architectural features, including the ground, floor, roof, ceiling, door/window, beam, column, crane beam, platform, ladder, pit, basement, foundation of aboveground large equipment and spatial relation, etc., as well as the segmented wall axis number, ground elevation at each floor and total height. For crane applications, the section has to show the crane contour and rail top elevation.

2.10 Structure

2.10.1 The basic engineering design documents for the structure section shall consist the following:

1 Description;

2 Design specification;

3 List of special structure;

4 Bill of materials;

5 Building(special structure) foundation layout;

6 Building(special structure) layout;

7 Building(special structure) elevation layout.

2.10.2 The content of description shall describe the following requirements:

1 Design principles shall describe the applicable national project construction regulations, policies and requirements.

2 Design scope shall describe the design scope of project and main works of project.

3 Design basis shall describe the meteorological condition, engineering geology, hydrogeology and design parameters of ground motion, etc.

4 Design scheme shall describe the ground and foundation scheme, structural style of main buildings(special structures), main construction materials, corrosion protection measures, fire protection measures and explosion-proof measures, etc.

5 The safety and environmental protection measures shall describe the main safety and environmental protection measures to be taken.

6 For the revamping and expansion projects, the utilization of existing buildings (special structures) shall be described.

7 In the existing problems and suggestions, the holding problems, further improvement and recommendations shall be described.

2.10.3 Design specification shall describe the following:

1 Design service life of the structure.

2 Environmental classification of buildings(special structures).

3 Load design criteria for main buildings(special structures).

4 The seismic design parameters for main buildings (special structures), such as the seismic precautionary intensity, seismic precautionary category, seismic precautionary grade, design seismic group and design basic seismic acceleration of ground motion, etc.

5 The names and serial numbers shall be clearly indicated for the applicable standards.

2.10.4 The content of the list of special structures shall comply with the specifications of Table 2.10.4.

Table 2.10.4 List of special structures

S/N	Name of special structure	Safety class of structure	Seismic geocautionary category	Classification of fire hazards	Fire-resistance rating	Floor space (m^2)	Characteristics of special structure					Work quantities of special structure				Times materials			Remarks
							Foundation type	Structure type	Envelope enclosure	Floor & ground	Roof	Steel structure(t)	Reinforced concrete structure (m^3)	Concrete structure (m^3)	Masonry structure (m^3)	Steel (t)	Wood (m^3)	Cement (t)	
1	√	√	√	√	√	○	√	√	○	○	○	√	√	√	√	√	√	√	
2																			
3																			
4																			
…																			

Notes: 1 The table lists out "√" as mandatory and "○" as optional, which may change subject to the actual location of the special structure.

2 The steel structure in the work quantities of special structure and in the materials all refer to steel structures except reinforcements.

2.10.5 The bill of materials shall list out the specifications and quantities of steels(reinforcements, shape steels)and cements.

2.10.6 The foundation layout of main buildings(special structures)shall show the foundation location and dimension.

2.10.7 The structure layout of main buildings(special structures) shall show construction north, column grid plan, beam plan, temperature expansion joint, settlement joint and seismic joint, as well as the control section dimensions of beams and columns, etc.

2.10.8 The structure elevation layout of main buildings(special structures)shall show the elevation arrangement of main elements, height for each floor and total height, etc.

2.11 Heating and ventilation

2.11.1 The basic engineering design documents for the heating and ventilation section shall consist of the following:

1 Description;

2 Design specification;

3 Bill of equipment and materials;

4 Bill of materials.

2.11.2 The content of description shall describe the following requirements:

1 Design scope shall describe the design scope of project and main works of project.

2 Design scheme shall describe the type, temperature, pressure and source of cooling(heating) medium, type of heating system, design and application of ventilation and air conditioning system, type of equipment, air duct arrangement principle, type of air exit, air distribution, safety and fire-protection interlock, etc. Furthermore, the design scheme shall provide the list of heating, ventilation, air conditioning performances, which shall describe the following:

1)The list of heating performances should list out the building name, heating area, thermal load area indicators, thermal load, type, size and quantity of heating equipment, etc.;

2)The list of ventilation performances should list out the building name, effective volume, air change rate, ventilation volume, type, size and quantity of ventilation equipment, etc.;

3)The list of air conditioning performances should list out the building name, air conditioning area, cooling load area indicators, cooling load, type, size and quantity of air conditioner, etc.

3 In the existing problems and suggestions, the holding problems, further improvement and recommendations shall he described.

2.11.3 The content of design specification shall describe the following requirements:

1 Design principle shall consist of the central heating design principles, local ventilation, thorough ventilation distribution, design principles of process and comfort air conditioning, noise elimination, vibration attenuation, safety, fire protection, health design, the principles of equipment selection and stand-by, instrument & control level, etc.

2 The names and serial numbers shall be clearly indicated for the applicable standards.

3 The meteorological parameters for design should describe the meteorological parameters for HVAC design in winter and summer respectively, including the heating and ventilation outdoor calculation temperature, air conditioning outdoor calculation temperature, ventilation and air conditioning outdoor calculation relative humidity, outdoor average wind velocity, wind direction at

max. frequency, air pressure and heating days, etc.

4 The indoor design parameters shall describe the indoor air temperature, relative humidity and scope of allowable variation according to the function of rooms respectively.

5 Selection of equipment and pipe materials shall describe the selection of equipment of heating, ventilation, air conditioning as well as the selection of valve and pipe materials, etc.

2.11.4 The bill of equipment and materials shall list out the type, size, quantity and technical requirements of heating, ventilation and air conditioning equipment as well as associated accessories, valves, etc.

2.11.5 The bill of materials shall list out the size, quantity, weight and technical requirements of pipe, plates, thermal insulating materials, etc.

2.12 Chemical analysis

2.12.1 The basic engineering design documents for the chemical analysis section shall consist of the following:

1 Description;

2 List of analysis items;

3 List of lab apparatuses;

4 Bill of materials;

5 Lab layout.

2.12.2 The content of description shall describe the following requirements:

1 Design principle shall describe the applicable national project construction regulations, lab equipment selection and import policies, and supporting conditions for project construction, etc.

2 Design scope shall describe the scope of design of project and the main works of project.

3 Design basis shall describe the utility engineering conditions.

4 The design scheme shall describe the main lab jobs, layout, indoor arrangement characteristics and building area, etc.

5 The selection of main equipment shall describe the selections of instrument, lab table, equipment table, balance table, sink, sample cabinet, chemical cabinet and sampling instrument, etc.

6 The main consumption should list out the consumption of electricity, fresh water and purified compressed air, etc.

7 The names and serial number shall be clearly indicated for the applicable standards.

8 In the existing problems and suggestions, the holding problems, further improvement and recommendations shall be described.

2.12.3 List of analysis items shall list out the sampling number, P&ID number, location of sampling, analysis medium, analysis item, control indicators, analysis method, analysis frequency, medium temperature and pressure, etc.

2.12.4 The list of lab apparatuses shall list out tag number, name, size, unit and quantity of apparatus and furniture, etc.

2.12.5 Bill of materials shall list out the material name, size, unit, quantity and material of construction, etc.

2.12.6 The lab layout shall show the following:

1 Building battery limit coordinate;

2 Lab's detail dimensions;

3 Locating dimensions of lab table, equipment table, balance table, fume cupboard, sink and floor-mounted equipment;

4 Construction north.

2.13 Fire-fighting

2.13.1 The basic engineering design documents for the fire-fighting section shall consist of the following:

1 Description;

2 List of fire-fighting process equipment;

3 Pipe list;

4 Bill of materials;

5 Fire-fighting equipment data sheet;

6 Fire-fighting piping & Instrument diagram;

7 Fire-fighting piping layout;

8 Fire-fighting equipment layout;

9 Building indoor fire-fighting sprinkler layout.

2.13.2 The description shall describe the project overview, design basis, design scope, design principle, special requirements on external fire-fighting ability and description of the conditions of supporting fire-fighting facilities, fire hazard category, firewater source, process discription, fire-fighting equipment configuration and control proposal, system division, scope of services, accident wastewater collection and treatment proposal, fire detection and fire alarm requirements, equipment and material selection requirements, pipe routing and anti-corrosion insulation requirements and the main applicable standards, etc.

2.13.3 The fire station description shall describe the conditions of supporting fire-fighting facilities, configurable quantities and specifications, staffing and the main fire-fighting equipment configuration of fire engine in the fire station, and also indicate the building area of fire station, building property, room composition and applicable codes and standards, etc.

2.13.4 The gas protection station description shall describe the scope of service, main responsibilities, process flow description, equipment configuration, selection specifications, staffing, functional rooms, regulations on safety and environmental protection and applicable standards, etc.

2.13.5 According to the equipment category, the list of fire-fighting process equipment shall list out item number of fire-fighting process equipment, equipment name, quantity, main operating conditions, technical specifications, main material of construction, etc.

2.13.6 The list of process equipment for fire station shall list out the quantities and specifications of fire engine, name, quantity, main operating conditions, specifications and construction material of fire-fighting equipment and auxiliary facilities, etc.

2.13.7 The list of process equipment for gas protection station shall list out the quantities and specifications of gas protection vehicle (ambulance), air filling pump, gas detector, personal protective equipment, etc.

2.13.8 Pipe list shall list out the pipe number, nominal diameter, piping class code, P&ID number, piping starting and terminating points, medium name, medium phase state, operating pressure, operating

temperature, design pressure, design temperature, etc.

Pipe list may be also arranged in a pipe description form, the description shall describe the medium name, operating pressure, operating temperature, design pressure, design temperature, pipe material, etc.

2.13.9 Bill of materials shall list out the name, model, size, unit, technical requirements, quantity and weight of pipe, pipe fittings, valve, fire-fighting equipment, well, pipe thermal insulation material and corrosion protection materials, etc.

2.13.10 The fire-fighting process equipment data sheets shall list out equipment number, equipment name, design basis data, construction dimensions, auxiliary equipment, etc., and shall comply with the following requirements:

1 The equipment and vessel data sheets shall list out the operating parameters, design parameters, medium name, content of special (corrosive) medium, corrosion allowance, nozzle flange parameters and thermal insulation requirements, etc.

2 The pump data sheet shall list out the medium name, operating condition, site condition, explosion-proof grade, lead material, type of driver, flushing, mechanical seal, inspection and test requirements, scope of supply, nozzle flange parameters, etc.

2.13.11 Fire-fighting piping & instrument diagram of fire-fighting shall show fire-fighting process flow, instrument control point, main control valves and the main control instruments for water sprinkler or water spray system.

2.13.12 The fire-fighting piping layout shall show the following:

1 Diameter and location of fire-fighting process pipe.

2 Locations of fire hydrant, fire monitor, box-type fire hydrant, foam generator, valve, siamese connection.

3 Location of water sprinkler, water spray and water curtain.

4 Location of fire standpipe.

2.13.13 The fire-fighting equipment layout shall show the location of main fire-fighting equipment which include fire hydrant, fire monitor, fire pool or water tank, fire pump house, water sprinkler system, water-spray system, water curtain system, and the distribution and type of foam station, foam hydrant, foam monitor, foam generator, foam sprinkler system, gas extinguishing system, dry powder extinguishing system, fire extinguishers, etc.

2.13.14 The fire pump station layout shall show the fire pool or water tank, pump and other equipment arrangement dimensions and relative relations.

2.13.15 The fire station building (special structure) and equipment layout shall show the coordinate of fire station, locating dimension of building (special structure), layout of fire hydrant, fire extinguisher, fire station room, garage, training facilities, etc.

2.13.16 The dimension of building (special structure) and equipment arrangement shall be shown in the layout of stationary fire-fighting equipment, including the foam extinguishing system, dry powder extinguishing system, gas extinguishing system, etc.

2.13.17 The building indoor fire-fighting sprinkler layout shall show the diameter and location of fire-fighting sprinkler pipe as well as locations of valve, water sprinkler, water spray and water curtain.

2.14 Water supply and drainage

2.14.1 The basic engineering design documents for the water supply and drainage section shall consist

of the following:

1 Description;

2 List of process equipment;

3 Pipe list;

4 Bill of materials;

5 Process equipment data sheet;

6 Process flow diagram;

7 Piping & instrument diagram(P&ID);

8 Elevation diagram;

9 Equipment layout;

10 Piping layout;

11 Special structure process diagram.

2.14.2 The description shall describe the project overview, design fundamental, design basis, scope of design, design principles, external system conditions and supporting conditions, water supply and drainage flowrate chart or balance chart, process scheme, utilities conditions, chemical analysis, fire-fighting & safety, water and energy saving and emission reduction, main consumption indicators, environmental protection, system division, control requirements, well selection, equipment & material selection requirements, pipe routing and anti-corrosion protection and thermal insulation requirements and the main applicable codes and standards, etc.

2.14.3 The list of process equipment shall list out equipment according to the equipment category, including item number of process equipment, equipment name, quantity, main operating conditions, technical specifications, principal materials, etc.

2.14.4 The content of pipe list shall comply with the Article 2.13.8 of this standard.

2.14.5 The bill of materials shall list out in categories the name, model, specification, technical requirements, unit, quantity and weight of pipe, valve, pipe fittings, instrument accessory, well, floor drain, cleanout, small equipment, fire-fighting auxiliary facilities, thermal and corrosion protection materials, etc.

2.14.6 The content of the process equipment datasheet shall comply with the Article 2.13.10 of this standard.

2.14.7 The process flow diagram shall show the complete process and shall include the water supply and drainage process equipment, process pipelines, main control schemes and stream data, etc.

2.14.8 Piping & instrument diagram(P&ID)shall show the following.

1 It shall show the tag number, name, model and specification of all equipment, as well as the scope of supply of package equipment.

2 The pipe shall show the following:

1)For all process pipes connecting with the equipment, the medium flowing direction, medium code, pipe number, nominal diameter, pipe class, heat tracing and thermal insulation requirements, etc shall be shown. When the same pipe has different pipe classes, The battery limit shall be clearly indicated when a pipe's grade changes;

2)The process and process-related valves. Tag number shall be provided for the automatic control valve;

3)All safety relief facilities, including safety valve, reducing valve and relief valve as well as their

tag numbers, etc.;

4)Main pipe fittings, including metal hose, filter, restriction orifice plate and blind, etc.

3 The instrument shall show the following:

1)Measuring instruments as well as package instruments wired to the control system shall be respectively numbered;

2)Control and interlock relations.

2.14.9 The legend and symbol used in the process flow diagram, piping & instrument diagram(P&ID) shall show the following:

1 Meaning of symbol, abbreviation and designation of equipment, pipe and instrument.

2 Requirements of compiling the legend and code of equipment, pipe and instrument.

2.14.10 The elevation diagram shall show the following:

1 Normal, maximum and minimum levels of gravity flow equipment or facility, and pressure head of pressure equipment.

2 Pipe orifice of equipment and special structure, number and elevation of weir trough.

3 Ground elevation, equipment foundation elevation and bottom elevation of special structure.

4 Pipe diameter, flow rate, length and hydraulic loss from pipe calculation.

5 Suction height and head of hydraulic lifting equipment.

6 Hydraulic loss of equipment and structure.

7 Hydraulic state of main process.

2.14.11 The equipment layout shall show the location and dimension of water supply and drainage process equipment, special structure, road and buildings as well as elevation arrangement of unit(main item), and shall also provide the list of equipment.

2.14.12 The pipe layout shall indicate the water supply and drainage pipe route, nominal diameter, number, location, medium name, and location of water supply and drainage wells in the equipment layout.

2.14.13 The special structure process diagram shall show the special structure type, stream direction, dimensions of main part and arrangement of equipment or packing, etc.

2.15 Cost estimation

2.15.1 The basic engineering design documents for the cost estimation section shall consist of the following:

1 Description;

2 Summary sheet of project costs;

3 Calculation sheet of other costs for construction project;

4 Summary sheet of costs;

5 Cost estimate sheet of unit construction project.

2.15.2 The contents of description shall describe the following requirements.

1 Compilation principles shall describe the current price level at the year of compilation, integrity of engineering contents and accuracy of quantities and investment control requirements, etc.

2 Compilation basis shall describe the following:

1)Relative laws, regulations, decrees and performances of the national, industry and local governments;

2)Feasibility study report and approved documents or authorized project application report;

3)Bill of basic engineering design;

4)Project equipment & material supply and price;

5)Existing cost estimate(budget)quota, estimate indicator and expense quota as issued by the relative industries or departments;

6)The prices of manhour, materials, machinery and index of costruction cost as issued by the relative industries or departments;

7)The relative contracts and agreements;

8)Other compilation basis.

3 Scope of compilation shall describe the scope of project, including the oil depot as well as utilities and auxiliary facilitie which consist of tank farm, loading/unloading facilities, pipe network, etc., and associated railway, jetty, power station and long distance pipeline, etc.

4 Compilation of cost estimate shall describe the applicable quota, index and cost standard.

5 In case that variation of investment is significant, cost estimate of design shall be compared with the estimate of investment in the feasibility study report and explain the reasons that estimate of design is more than the investment of estimate, including scheme change, price rising, works increasing and more stringent standard, etc.

2.15.3 The summary cost estimate sheet of project shall list out the construction investment, loan interest in construction period and basic required current fund. Construction investment shall consist of fixed-asset investment(including project cost and other fixed-assets costs), intangible assets investment, other assets investment and contingency.

2.15.4 The calculation sheet of other costs of project construction shall list out the name, calculation basis and rate and calculation formula of others, mixed-assets, intangible assets investment and contingency. Cost classification shall comply with the applicable national standards, and shall show the industrial characteristics.

2.15.5 The summary sheet of unit cost shall list out the equipment procurement cost, main material cost, installation cost and civil cost based on compilation of unit construction project engineering cost estimate.

2.15.6 The cost estimate sheets of unit construction project shall be devided into those for the unit civil engineering and unit equipment & installation. The unit civil engineering sheet shall list out in the building and structure categories, the basic data for calculating the civil costs, including quota number, name, unit, quantity, unit price and total cost, etc. The unit equipment & installation sheet shall list out in categories the basic data for calculating equipment procurement cost, bulk material cost and installation cost, including the indicatator number, name, unit, quantity, material of construction, unit weight, total weight, model and specifications, unit price and total cost, etc. Classification of buildings, special structures, equipment and materials shall be consistant with classification of basic design document for each engineering design discipline.

2.16 Fire-fighting design report

2.16.1 The fire-fighting design report shall consist of design basis, project overview, depot fire hazards analysis, fire-proof precautions, fire-fighting design, special investment estimate and related attached drawings, etc.

2.16.2 Design basis shall describe the design contract, the national, professional and local policies, laws and regulations and applicable code and standards.

2.16.3 Project overview shall describe oil depot's regional location, kinds of project (grass-root, expansion and revamping), ways of material going in and out of oil depot, mode of storage, way of transferring, fire-fighting conditions, the supporting relations herween oil depot and the neighboring authorities as well as fire-fighting facilities.

2.16.4 Oil depot fire hazards analysis shall describe the dangerous materials, dangerous process and division of explosion hazardous zone in the depot. The hazardous materials shall list out the name of dangerous material, fire hazard category, quantities, operating condition, characteristics, fire control requirements and methods.

2.16.5 The fire protection measures shall describe the following:

1 General plot plan of oil depot, fire spacing, fire-fighting access, evacuation exit and evacuation distance.

2 Safety and control measures on hazardous materials under normal condition, control measures on hazardous materials under abnormal condition, hazardous ous material leak detection and alarm.

3 Classification of hazardous area.

4 Lightning protection, anti-electrostatic accumulation.

5 Power supply safety.

6 Building (special structure) area and location, fire spacing, pressure relief ratio, fire hazard category and fire resistance rating, building material category, building exhaust ventilation measures, fire protection for special structures and steel structures, etc.

7 Main measures adopted to prevent direct drainage of leaked inflammable liquid and contaminated firewater.

2.16.6 The fire-fighting design shall describe the distributions of fire-fighting system, mobile fire-fighting equipment, fire alarm system and other fire-fighting equipment in the depot.

2.16.7 The special investment estimate shall list out the investment of fire-fighting system, mobile fire-fighting equipment, fire alarm system and other fire-fighting equipment.

2.16.8 The related attached drawings shall show the following:

1 Regional location plan of oil depot;

2 Overall plot plan of oil depot;

3 Fire-fighting piping & instrument diagram;

4 Fire-fighting equipment layout;

5 Automatic fire alarm and fire-fighting control system diagram;

6 Classification of hazardous area in oil depot;

7 Flammable and toxic gas detector layout.

2.17 Environmental protection design report

2.17.1 The environmental protection design report shall consist of the design basis, project overview, main sources of pollution and main pollutants, environmental protection facilities and measures, landscaping planning, environmental management, environmental monitoring, implementation of environmental impact assessment document and implementation of approval comments, environmental protection investment estimate, expected effect of environmental protection and associated attached

drawings, etc.

2.17.2 Design basis shall describe the following:

1 Environmental impact assessment report and approval document for project.

2 Related project document and approval document in feasibility study phase.

3 Design contract or assignment document.

4 National, industrial and local policies, laws, regulations and requirements on environmental protection.

5 Applicable codes and standards.

2.17.3 Project overview shall describe the following:

1 Location of site, kinds of project (grass-root, expansion and revamping), capacity of project.

2 Process scheme and utility configuration.

3 Consumption of raw materials, auxiliary materials and utilities.

4 The clean processing is described in respect of storage & transportation scheme, selection of main equipment, material (energy) consumption, pollutant emission and treatment measures, etc.

5 Capacity of existing project, emissions of different kinds of pollutants, capacity and operation of environmental protection facilities.

2.17.4 For the main pollution sources and pollutants, the main pollution sources and emission of main pollutants during construction and operation of the project shall be analyzed to a detail complying with the following requirements:

1 The list of emission shall list out the source of emission, type and flowrate of offgas emitted, emission flowrate and concentration of main pollutants, and frequency, destination and condition of emission.

2 The list of wastewater discharge shall list out the source of wastewater, type and flowrate of wastewater being discharged, discharge flowrate and concentration of main pollutants, and discharge frequency and destination.

3 The list of solid wastes shall list out the source of solid wastes generation, name, quantities, composition, state and type of solid wastes being discharged, and frequency and destination of discharge.

4 The list of noise emission shall list out the name and quantity of main noise sources, and treated A-weighted sound pressure level.

2.17.5 The environmental protection facilities and measures shall describe the capacity of treatment facilities for different pollutants, treatment process, treatment result and prevention and control measures adopted to deal with potential environmental hazards. The revamping and expansion projects shall also describe the availability of existing environmental protection facilities.

2.17.6 The landscaping planning shall describe the greening layout, selection of greening tree species and plants, greening area and greening coverage rate, etc.

2.17.7 Environmental management shall describe the establishment, function, staffing of environmental management organization and establishment of each environmental protection system, etc.

2.17.8 Environmental monitoring shall describe the establishment and staffing of environmental monitoring organization, apparatus configuration, location of stationary (online) monitoring, content and frequency of monitoring, etc.

2.17.9 The implementation of the environmental impact assessment document and approval document

shall be compared with the technical indicators and requirements in the conclusion of environmental impact assessment and the approval in terms of emission of different kinds of pollutants, environmental protection measures, clean process, environmental monitoring, etc. The existing differences shall be described.

2.17.10 The environmental protection cost shall consist of the costs of the following facilities:

1 The cost of emission prevention and treatment facility, wastewater prevention and treatment facility, solid wastes treatment (disposal) facility, noise prevention and treatment facility and underground water pollution prevention and treatment facility, etc.

2 The costs of landscaping, water and soil conservation and other ecological protection facilities.

3 The cost of environmental monitoring facility.

2.17.11 The achievable expected results and assessment after implementation of all environmental protection measures shall be described in the expected environmental protection results, which shall be compared with the conclusion from the approved environmental impact assessment document.

2.17.12 The attached drawings shall include regional location plan of oil depot and overall plot plan of oil depot.

2.18 Safety facility design report

2.18.1 The safety facility design report shall consist of the design basis, project overview, project risks, hazards analysis, implementation of safety countermeasures and proposals in the project safety assessment report, safety facilities and measures in the design, emergency response measures, establishment and staffing of safety management organization, safety facility investment estimate, conclusions and associated attached drawings, etc.

2.18.2 Design basis shall describe the following:

1 The safety assessment report and approval document for the project.

2 Related project document and approval document in feasibility study phase.

3 Design contract or assignment document.

4 National, industrial and local policies, laws, regulations and requirements on safety.

5 Applicable codes and standards.

2.18.3 Project overview shall describe the following:

1 Location of site, kinds of project (grass-root, expansion and revamping), scope of work and capacity of project.

2 Overall plot plan and required land area.

3 Process scheme and brief process.

4 Capacity or load of supporting and auxiliary facilities, consumption of raw and auxiliary materials and brief process.

5 Name, quantity, specification and material of main equipment and facilities; as well as types of main special equipment.

6 Work shift and staffing.

7 External supporting conditions or facilities.

8 The natural conditions of project site such as the meteorology, hydrogeology, geology, earthquake, etc.

9 Distributions of neighboring enterprises, residential areas, public places (facilities), natural

reserves, military management areas, etc.

2.18.4 The project hazards analysis shall describe the following:

1 Chemical identity and hazard category of relevant hazardous chemicals.

2 Name, state, quantity, fire hazard, application condition, extinguishing method, classification of hazardous area of inflammable and combustible materials stored and used for the project.

3 Name, state, quantity or concentration, toxicity, use conditions, first-aid treatment method after poisoning and toxic levels of toxic materials stored and used for the project.

4 Name, state, type, quantity or concentration, use condition and first-aid treatment method of corrosive materials in use.

5 Source of main noises and treated A-weighted sound pressure level for the project.

6 High-temperature burn, fall, dust, radioactive radiation, natural disaster and other hazardous and harmful factors.

7 Identification and analysis of major hazard sources.

8 Project accident risk analysis may be carried out in a qualitative, quantitative or semi-quantitative manner to predict and analyze the possibility and severity of the accident.

9 Maximum waste water volume during fire-fighting.

2.18.5 The safety countermeasures and proposals in the project safety assessment report shall describe the implementation of all safety countermeasures and proposals, and the causes for no implementation or partial implementation.

2.18.6 The safety facilities and measures selected in the design shall describe the following:

1 Safety measures in the layout, dual power supply measures, instrument detection, alarm and interlock devices, equipment and mechanical safety protection devices, explosion-proof devices, workplace safety protection facilities, safety signs, natural disaster protections, and other facilities and measures for preventing accident.

2 Pressure relief devices, non-return devices, emergency treatment devices and other facilities and measures for accident control.

3 Devices preventing fire spread, fire-fighting devices, emergency individual disposal devices, evacuation shelter, PPEs and other devices and measures for minimizing and eliminating accident impact.

2.18.7 Emergency rescue measures shall describe the following:

1 The setup and equipped situation of emergency rescue organization, emergency rescue staff and emergency rescue equipment.

2 Setup and equipment of fire-fighting(gas protection)team, fire-fighting(gas protection)facilities and equipment.

3 Emergency rescue measures.

2.18.8 Establishment and staffing of safety management organization shall describe the safety management organization and its duties, qualification and quantity of required safety management staff after startup. The existing situation of current organization and staffing as well as availability shall also be described for the revamping and expansion projects.

2.18.9 The safety facility cost, as the Article 2.18.8 of this standard, shall list out the individual cost breakdown of each category and its ratio to the safety facility costs, as well as the ratio of safety facility cost to the total project investment.

2.18.10 The expected results on safety facilities and measures in the design shall describe the following:

1 Safety conditions in the site location and safety spacing to the neighboring facilities.

2 Justification on reliability of the adopted technology and process, and safety and reliability of process design.

3 Safety of main selected equipment and facilities.

4 Compliance of project safety facility level with the applicable national and industry standards currently in use.

5 Achievable expected results after implementation of safety measures for the project.

2.18.11 The attached drawings shall include the following:

1 Regional location plan of oil depot;

2 Overall plot plan of oil depot;

3 Process flow diagram;

4 Classification of hazardous area of oil depot;

5 Lightning protection and grounding layout of oil depot;

6 Flammable and toxic gas detector layout;

7 Fire-fighting equipment layout.

2.19 Occupational health design report

2.19.1 The design report of occupational health facilities shall consist of the design basis, project overview, occupational disease hazard and impact analysis, occupational disease protection facilities and control measures, organization and management of occupational disease prevention and control work, implementation of occupational disease hazard preassessment report and approval document, occupational disease protection facility investment estimate, expected occupational disease protection results and attached drawings, etc.

2.19.2 Design basis shall describe the following:

1 The occupational disease hazard pre-assessment report and approval document for project.

2 Related project document and approval document in feasibility study phase.

3 Design contract or assignment document.

4 National, industrial and local policies, laws, regulations and requirements on occupational health.

5 Applicable codes and standards.

2.19.3 Project overview shall describe the following:

1 Location of site, kinds of project (grass-root, expansion and revamping), scope of work and capacity of project.

2 Process scheme and brief process.

3 Storage materials, utilities materials and auxiliary materials.

4 Overall plot plan.

5 Main equipment and facilities.

6 Work shift and staffing.

2.19.4 The content of occupational disease hazard and impact analysis shall describe the following requirements:

1 Toxic materials shall describe the name, state, invasive route, health hazard, occupational exposure limits, first-aid treatment method and toxic levels of toxic materials used in the project.

2 Corrosive materials shall describe the name, type, state, concentration, invasive route, health hazard, occupational exposure limits and first-aid treatment of corrosive materials used in the project.

3 Noise hazards shall describe the main source of noise, high noise zone and treated A-weighted sound pressure level.

4 Other occupational disease hazards shall describe the hazards and sources of dust, high temperature, radioactive radiation, etc.

5 Describe the location or position of all occupational disease hazards and the potentially affected people.

2.19.5 The content of occupational disease protection facilities and measures shall describe the following requirements:

1 The compliance of project site selection and overall plot plan with the relevant national and professional occupational health standards shall be described.

2 The compliance of the production process and equipment layout with the relevant national occupational health standards shall be described in terms of the advanced nature, automation level, closed operation, equipment arrangement, prevention of escape and cross contamination, etc. of the storage scheme or process.

3 The compliance of architectural hygiene design with the relevant national occupational health standards shall be described in terms of the internal structure, material selection, daylighting, lighting, and HVAC, etc. of the building design.

4 The compliance of design of following occupational disease protection facilities and control measures with the applicable national occupational health standards shall be described in a selective manner according to the characteristics of the production process:

1) Anti-poison facilities and measures;

2) Toxic leak detection and alarm facilities;

3) Facilities and measures for noise abatement and noise reduction;

4) Ventilation, dust removal, dehumidification facilities;

5) High temperature-proof and winterization facilities and measures;

6) Radiation hazard protection facilities;

7) Emergency rescue station or toxic gas protection station;

8) Emergency shower and eye wash equipment;

9) Personal protective equipment;

10) Work-related sanitary facilities;

11) Warning signs.

2.19.6 The section of organization and management of occupational disease prevention and control work shall describe the situation of the establishment of occupational health management organization, staffing and management system establishment, etc.

2.19.7 The implementation of occupational disease hazard preassessment report and approval comments shall describe the implementation of all control measures proposed in the occupational disease hazard preassessment report, the implementation of the relevant proposals, the implementation of approval comments and the reasons for no adopting the comments.

2.19.8 The cost of occupational disease protection facilities should comply with the following requirements:

1 The occupational health precaution and treatment facilities should consisit of the costs of toxic-proof and dust-proof facilities, high temperature-proof and winterization facilities, HVAC, dust collection and dehumidification facilities, noise abatement and noise reduction facilities, radiation protection facilities, etc.

2 The occupational hazard monitoring facilities should consisit of the costs of toxic gas alarm and monitoring equipment for dust, toxicant, radiation, etc.

3 The emergency response facilities should consisit of the costs of emergency rescue station, toxic gas protection station, emergency shower and eye wash equipment, etc.

4 Others should consisit of the costs of personal protective devices, auxiliary sanitary facilities and warning signs.

2.19.9 The expected results of occupational disease protection shall describe the occupational disease protection facilities in the design and achievable results after implementation of control measures.

2.19.10 The attached drawings shall include regional location plan of oil depot, process flow diagram, flammable and toxic gas detector layout.

2.20 Seismic design report

2.20.1 The seismic design report shall consist of the basis of compilation, project overview, assessment of earthquake and geological disaster in the site, adopted seismic precautionary parameters, technical measures on seismic design and attached drawings and figures, etc.

2.20.2 Basis of compilation shall describe the following:

1 Earthquake safety assessment report of the construction site;

2 Geotechnical survey report of construction site;

3 Design contract;

4 National and industrial earthquake resistance and disaster reduction design policies and regulations.

2.20.3 Project overview shall describe the following:

1 Location of site, capacity and kinds of project (grass-root, expansion and revamping).

2 The natural conditions in the project site such as landform, topography, engineering geology, hydrogeology, meteorology and earthquake, etc.

3 Overall plot plan.

2.20.4 The site earthquake-induced geological disaster assessment shall describe the earthquake-induced geological disaster assessment conclusions and the way of dealing with the following geological disasters based on the site earthquake safety assessment report:

1 Earthquake fault;

2 Slope stability;

3 Liquefaction of saturated sands and earthquake sinking of soft soil;

4 Rockfall, rift;

5 The disasters of tsunami, swell, water burst;

6 Seismic structure conditions sensitive to earthquake in a hypocentral region.

2.20.5 The seismic precautionary parameters shall describe the following:

1 Seismic precautionary intensity in the site;

2 Site category;

3 Design seismic group;

4 Design basic acceleration value of ground motion in the site;

5 Max.value of horizontal earthquake influence coefficient in the site;

6 Design characteristic period value of ground motion in the site;

7 Response spectrum of site seismic design.

2.20.6 The technical measures for seismic design shall describe basic requirements on seismic design, importance classification of buildings(special structures) and equipment, seismic performance of main materials, earthquake action calculation and seismic checking basis, compliance with related seismic conceptual design, and shall comply with the following requirements.

1 The layout and site selection principles, buildings(special structures) layout principles, main equipment and pipe arrangement principles, and recommend the appropriate and effective measures to deal with the geological disaster induced by earthquake in the site shall be described.

2 Technical measures stipulated in the buildings(special structures)seismic design shall describe the following:

1)The building scheme, structure scheme, seismic fortification category and seismic grade of each main buildings(special structures), list of main buildings, and list of main structures;

2)General requirements and special requirements on structural seismic system for the buildings (special structures);

3)The applicable codes for buildings(special structures)earthquake action calculation as well as seismic measures and seismic verification;

4)Treatment adopted for liquefied soil, soft soil and special subsoil;

5)Special requirements of seismic structure on material and construction quality.

3 The equipment seismic design principles and measures adopted shall describe the importance classification of equipment, scope and result of equipment seismic verification.

4 The electrical seismic design principles and measures adopted shall describe the following:

1)Seismic fortification principles for selection of electrical equipment and materials;

2)Scope and result of electrical equipment seismic verification;

3)Special construction and installation requirements of electrical equipment.

5 The instrument seismic design principle and measures adopted shall describe the following:

1)Seismic precautionary principles for the selection of instrument equipment and materials;

2)Special construction and installation requirements of instrument equipment;

3)Seismic fortification measures for underground cables.

6 The piping seismic design principles and measures adopted shall describe the following:

1)Seismic measures for piping fittings, valves and pipe assemblies;

2)Proper necessary seismic performance shall be available for the piping connection with storage tank or other equipment;

3)Scope and result of piping seismic verification;

4)Seismic requirements of construction and installation for piping and assemblies.

7 The seismic design principles of water supply & drainage system and measures adopted shall describe the following:

1)Seismic measures for water supply &. drainage system equipment and piping;

2)Seismic measures of pipe connection;

3)Seismic requirements of construction and installation for equipment and piping of water supply &. drainage system.

2.20.7 The associated attached drawings and figures shall include the following:

1 Regional location plan of oil depot;

2 Overall plot plan of oil depot;

3 List of buildings;

4 List of special structure.

2.21 Energy-saving design report

2.21.1 The energy-saving measures design report shall include the design basis, project overview, energy supply and energy consumption, main energy-saving measures, conclusions, existing problems and proposals, and associated attached drawings(tables), etc.

2.21.2 Design basis shall describe the following:

1 Energy saving assessment and review comments for the project;

2 Engineering design contract;

3 Energy saving policies, laws and regulations at the national, industrial and local levels;

4 Applicable codes and standards.

2.21.3 Project overview shall describe the following:

1 Location of site, kinds of project (grass-root, expansion and revamping), scope of work and project capacity;

2 Main technical schemes and process descriptions of oil depot process and utilities;

3 Main equipment and facilities;

4 Overall plot plan;

5 The present energy utilization conditions of the project shall include the energy availability, type, quantity and price of energy being consumed, main energy-saving measures, existing problems in energy utilization, etc.

2.21.4 Energy supply and energy consumption index shall describe the following:

1 Type, quantity, supply and consumption of energy required for the project;

2 Fuel, steam, electricity and water balances at normal conditions;

3 Energy consumption for storage or transferring per ton of material and condensate recovery rate, etc.

2.21.5 Main energy-saving measures shall describe the following:

1 Proper process parameters on material storage temperature and storage tank quantity, etc.;

2 Energy-saving measures on tank type and heat insulation, etc.;

3 Oil vapor recovery measures;

4 Energy-saving measures for oil product blending;

5 Energy-saving measures for pipeline heat tracing;

6 Efficient utilization of feedstock and product effluent energy;

7 The energy integration between the project and neighboring enterprises;

8 Energy-saving new equipment and promotion products adopted;

9 Comprehensive utilization of water resources;

10 State-of-the-art technology, state-of-the-art material and structural type of main buildings in the design as well as their energy-saving results;

11 Distribution of power supply and equipment selection;

12 Other energy-saving measures.

2.21.6 Conclusions shall describe the project energy supply scheme and project energy utilization level.

2.21.7 In the existing problems and suggestions, the holding problems, further improvement and recommendations shall be described.

2.21.8 The associated attached drawings and figures shall include the following:

1 Regional location plan of oil depot;

2 Overall plot plan of oil depot;

3 Process flow diagram;

4 Steam balance diagram(table);

5 Water balance diagram(table);

6 Fuel balance diagram(table);

7 List of electrical loads.

3 Detail engineering design

3.1 Process

3.1.1 The detailed engineering design documents for the process section shall consist of the following:

1 Description;

2 Battery limit condition table;

3 Pipe list;

4 List of process equipment;

5 List of special valves;

6 Process equipment data sheet;

7 Piping & instrument diagram (P&ID);

8 Utility piping and instrument diagram (U&ID).

3.1.2 In addition to complying with the Article 2.2.2 of this standard, the content of description shall provide further descriptions for the variations.

3.1.3 The content of battery limit condition table shall comply with the Article 2.2.3 of this standard.

3.1.4 In addition to complying with the Article 2.2.4 of this standard, the content of pipe list shall indicate the pipe testing medium, cleaning medium, purging requirements, pipe inspection class and flow diagram number, etc.

3.1.5 The content of list of process equipment shall comply with Article 2.2.5 of this standard.

3.1.6 The content of list of special valves shall comply with Article 2.2.6 of this standard.

3.1.7 In addition to complying with Article 2.2.7 of this standard, the content of process equipment data sheet shall be further updated based on the process equipment detailed engineering design documents or final documents returned by the equipment vendor.

3.1.8 In addition to complying with Article 2.2.11 of this standard, the piping & instrument diagram (P&ID) shall also show the auxiliary pipes as well as the process-related venting pipes, drain pipes, purging pipes, scope of the complete set of equipment supply and other special requirements, etc., and should be further updated based on the piping installation drawings.

3.1.9 In addition to complying with Article 2.2.12 of this standard, the utility piping and instruments diagram (U&ID) should be further updated based on the piping installation drawing.

3.2 Piping

3.2.1 The detailed engineering design documents for the piping section shall consist of the following:

1 Description;

2 Design specifications;

3 List of piping materials;

4 Bill of materials;

5 Piping and equipment layout;

6 Piping installation drawing;

7 Heat tracing pipe installation drawing.

3.2.2 In addition to complying with Article 2.3.2 of this standard, the content of description shall provide further descriptions for special requirements on construction and acceptance as well as applicable codes and standards.

3.2.3 Design specifications shall include the pipe material, heat insulation and painting, etc., and complying with the requirements of Article 2.3.3 Item 3–5 of this standard.

3.2.4 The list of piping materials shall list out the nominal diameter, specifications, quantity, weight and technical requirements of each pipe, pipe fittings, valve, heat insulating material one by one according to the pipe number.

3.2.5 The bill of materials shall list out the specification, quantity and weight of all pipes, valves, anti-corrosion, heat insulating materials, etc., and include varieties of small process equipment and attachments and fittings, complying with the following requirements:

1 The piping equipment materials list should list out all types of valves used in the project and indicate the nominal diameter, pressure rating, technical requirements, quantity and standard, etc. of valve on valve type basis.

2 The piping materials list should list out the specifications, technical requirements, quantity and weight of pipe, pipe attachments, heat insulation material, anti-corrosion material, etc.

3 The equipment materials list should list out the name, specifications, material, technical requirements, unit and quantity of various small process equipment and accessories.

3.2.6 In addition to complying with Article 2.3.5 of this standard, the piping and equipment layout shall show the following:

1 Locating dimension of pipe pier and pipe rack, elevation and gradient of pipe sleeper.

2 Overall dimension and locating dimension of equipment.

3 Plan dimension and locating dimension of overpass bridge, operating platform and ladder;

4 Structure schematics of door, column, beam, platform, ladder, handrail and other buildings (structure).

5 Instrument tray and cable tray.

6 Battery limit, road coordinate and drawing connection number.

7 Scope of maintenance for special equipment.

8 The content of drawing indicating dimension unit, relative elevation, continuation drawing number, pipe construction and acceptance criteria, etc.

9 Class and grade of pressure pipe.

3.2.7 The pipe installation drawing shall show the following:

1 Pipe, pipe fitting, flange, valve, etc.

2 Tracing pipe, steam feed and condensate drain header and valve, etc.

3 Pipe number, medium flow direction, pipe gradient and pipe class break, etc.

4 Tag number of flow instrument, level instrument, pressure instrument and temperature instrument, etc.

5 Location and elevation of equipment and equipment nozzles.

6 Location, plan dimension and elevation of operating platform, and overpass bridge.

7 Pipe elevation, valve elevation, pipe branch, reducer, instrument specifications, pipe vent and drain, etc.

8 Structure style, dimension and installation requirements of piping support and hanger.

3.2.8 The heat tracing pipe layout shall show the location and pipe number of heat tracing medium header as well as the location and type of manifold. Furthermore, the pipe number of spare joint, distributing pipe and heat tracing pipe, the location and number of heat traced pipe and instrument tag number, etc. shall be shown in the heat tracing pipe layout.

3.3 Equipment

3.3.1 The detailed engineering design documents for the equipment section shall consist of the following:

1 Pressure vessel calculation sheet;

2 Description;

3 Technical conditions for important equipment;

4 Risk assessment report for Class Ⅲ pressure vessel;

5 Equipment general drawing and components drawing.

3.3.2 Pressure vessel calculation sheet shall include the strength and stability calculations of main pressure components.

3.3.3 In addition to complying with Article 3.3.2 of this standard, the content of description shall describe the special requirements of construction and acceptance as well as applicable codes and standards.

3.3.4 The content of technical conditions for important equipment shall comply with the following requirements:

1 Equipment manufacturing, inspection and acceptance shall describe the applicable codes, standards and related regulations.

2 Equipment materials adopted shall describe the material standard and contour, special performance index, state of supply, steel sheet NDT, forging class and welding consumables specifications, etc.

3 Welding requirement shall describe the recommended welding method, welding procedure, weld surface shape and appearance, welding rework requirements, etc.

4 NDT requirement shall describe the way of joint NDT, testing percentage and qualified level, etc.

5 Heat treatment requirement shall describe the equipment heat treatment requirements, methods, applicable codes and standards, and control indicators, etc.

6 Heat insulation requirement shall describe the heating insulating material, structure, thickness and construction acceptance criteria, etc.

7 Anti-corrosion requirement shall describe the scope of application, applicable codes and standards, material selection, paint sample test requirements, painting process requirements, surface treatment requirements, construction environment requirements, painting material name, number of brushing and thickness of dry film, inspection and acceptance requirements and handover documents, etc.

8 Other technical condition shall describe the equipment installation and operation instructions, package and transportation requirements, structure assembly requirements for key internals, equipment field installation and acceptance criteria, etc.

3.3.5 For Class Ⅲ pressure vessels, the risk assessment report indicating the main failure mode and risk control, etc. shall be provided.

3.3.6 Equipment general drawing and components drawing shall show the following:

1 Equipment design conditions such as design pressure, temperature, corrosion allowance, reference wind pressure, seismic fortification intensity, test pressure, type of site soil, ground roughness, corrosion-resistant and heat insulating materials and heating area, etc.

2 Sizes of all nozzles, flange pressure class and style, nozzle welding type, etc.

3 List of material S/N, size, mass, standard name and No., etc.

4 Equipment design drawing.

5 Additional technical requirements on material, prefabrication, manufacture, welding construction and acceptance, etc.

3.4 General plot plan and transportation

3.4.1 The detailed engineering design documents for the general plot plan and transportation section shall consist of the following:

1 List of equipment for transportation and handling;

2 Bill of materials;

3 Overall plot plan of oil depot;

4 Elevation layout of oil depot;

5 Road and rain water drainage layout in oil depot;

6 Unit (main item) elevation layout;

7 Earthwork drawing;

8 Pipeline coordination drawing;

9 Detailed drawing.

3.4.2 The content of list of equipment for transportation and handling shall comply with Article 2.5.4 of this standard.

3.4.3 The content of bill of material shall comply with Article 2.5.5 of this standard.

3.4.4 Overall plot plan of oil depot should show the following:

1 Building coordinate grid, measurement coordinate grid, wind rose, legend and description, etc.

2 Oil depot fence wall, gate, guard house layout and coordinate, battery limit and coordinate of each facility, oil depot road layout and coordinate, retaining wall and slope protection layout.

3 Location of equipment and building (special structure) within the battery limit of each facility.

4 Layout and coordinate of rail line, metering facility, transportation and loading facilities, coordinate of demarcation point of railways inside and outside the plant.

5 Name or number of each facility and main building (special structure).

6 Present condition drawing for revamp and expansion projects.

7 Location and width of process and heat pipe networks.

3.4.5 The elevation layout of oil depot shall comply with Article 2.5.8 of this standard.

3.4.6 Road and rain water drainage layout in oil depot shall show the following:

1 Building coordinate grid, measuring coordinate grid, north arrow, legend, description and bill of quantities, etc.

2 Oil depot fence wall, gate, guard house layout, battery limit, name and coordinate of each facility, layout and coordinate of rail line, metering facility, transportation and loading facilities, etc.

3 Road layout and center coordinate, road number, width of road, road turning radius, road

design elevation at road junction and gradient change point, slope direction of road longitudinal slope, gradient and slope length, location, coordinate and number of grade crossing, dimension of square and turnaround; rain ditch, bridge culvert, torrent gutter, location, number and coordinate of drop facility, width, gradient and slope direction of drainage ditch, ditch length, ditch bottom elevation at the starting and ending points, clear span and length of bridge culvert, bottom elevation at the entrance and exit.

4 Road number, center coordinate at the starting and ending points, width and length, etc.

5 Rain ditch number, coordinate at the starting and ending points, elevation, ditch length, width and longitudinal slope, etc.

6 Culvert number, culvert center coordinate, clear span, culvert length, center coordinate at top of culvert, entrance and exit elevation at culvert bottom, etc.

7 Torrent chute number, elevation at entrance and exit, etc.

3.4.7 The content of earthwork drawing shall comply with Article 2.5.10 of this standard.

3.4.8 The pipeline coordination drawing shall show the following:

1 Building coordinate grid, Construction North, legend and description.

2 Location of oil depot fence, gate and guard house; and battery limit line, name and coordinate for each facility.

3 Location, coordinate, width and elevation of oil depot's road location, coordinate, width and bottom elevation of rain ditch.

4 Location, coordinate and nominal diameter of underground water supply & drainage pipes; location of valve well, inspection well and rainwater well; location and coordinate of all buried cables; location, coordinate and width of all aboveground pipe supports and trenches; location of lighting pole; coordinate of pipe connection inside and outside the oil depot.

5 Road type, width and center coordinate of pipeline coordination cross-section along the main inter-block channel, location and width of rain ditch, location, width and center coordinate of aboveground pipe support and trench, location, coordinate and nominal diameter of underground pipe, location of lighting pole, landscaping location and width of occupied land area.

3.4.9 In addition to complying with Article 2.5.11 of this standard, the content of unit (main item) vertical layout plan shall show the following:

1 Detailed drawing and master drawing of driveway paving, sidewalk paving, side walk, rain ditch , culvert, overpass bridge, overpass ladder, fire dike, unit ramp, etc.

2 Number and center coordinate of overpass ladder, elevation at top of dike, ground elevation inside and outside the dike, dike clear height inside and outside the dike, and numbers of steps inside and outside the dike, etc.

3 Number and center coordinate of overpass bridge, clear span, ground elevation, clear height, bridge plate thickness, bridge surface elevation and number of steps, etc.

4 Culvert number, culvert center coordinate, clear span, culvert length, center coordinate at top of culvert, entrance and exit elevation at culvert bottom, etc.

3.4.10 Detailed drawing shall show the following:

1 The content of detailed drawing of retaining wall and revetment include the dimension, material and structure requirements of retaining wall and revetment, etc.

2 The road cross-section drawing include the shape and dimension of road section, road and road shoulder width, road cross slope, subgrade slope value, road structure material and thickness,

structure of road slab joint for rigid road, location of tie rod in the road slab, location of dowel steel in the road slab, road division at the junction, etc.

3 The content of kerb detailed drawing contains the kerb overall dimensions and materials.

4 The content of rain ditch detailed drawing include the section, dimension and material of the ditch, and dimension and material of ditch cover.

5 The contents of bridge culvert detailed drawing include the plan, section, dimension and material of bridge culvert, and dimension and material of cover.

6 The content of torrent chute and hydraulic drop facility detailed drawings include the plan, section and profile, dimension and material of torrent chute and hydraulic drop facility.

3.5 Instrumention & control

3.5.1 The detailed engineering design for instrumention & control section shall consist of the following:

1 Description;

2 Instrument index;

3 Cable list;

4 Alarm and trip point setting list;

5 Instrument specifications;

6 Instrument panel (cabinet) specifications;

7 On-line analyzer room specifications;

8 Bill of materials;

9 Center control room (CCR) layout;

10 Flammable and toxic gas detector layout;

11 Instrument cable tray or routing;

12 Instrument electronic & wiring layout;

13 Instrument panel (cabinet) layout;

14 Instrument panel (cabinet) wiring diagram;

15 Instrument impulse lines hook-up drawing;

16 Interlock diagrams;

17 Sequence control logic (time sequence) diagram;

18 Complex loop control diagrams;

19 Instrument power distribution diagram;

20 Instrument grounding diagram.

3.5.2 When distributed control system (DCS), safety instrumented system (SIS), programmable logic control (PLC) system and supervisory control and data acquisition (SCADA) are applied, system specification and I/O index shall be provided where applicable.

3.5.3 The content of description shall describe the following requirements:

1 The layout and sizes of control room and auxiliary facilities shall be specified.

2 For any change of instrument selection, the causes of change and traceability shall be provided.

3 The requirements of instrument power supply, air supply, heat tracing and water return, sealing liquid, flushing, etc. shall be specified.

4 The scope for instrument and control system shall be specified for the instruments provided with package equipment.

5 The interface between different disciplines and between contractor and package vendors, etc. shall be specified in construction requirements and attentions.

3.5.4 In addition to complying with Article 2.6.5 of this standard, the content of instrument index shall also include instrument in pulse lines hook-up drawings number.

3.5.5 The instrument cable list shall list out the cable number, model, specification, length and starting & terminal points, etc.

3.5.6 Instrument tag number, alarm and trip purpose, process operating alarm and trip point, etc. shall be indicated in the alarm and trip point setting list.

3.5.7 The instrument specification shall specify the specifications and data of all instruments according to the instrument type, in which the instrument tag, name, service, process operating conditions, quantity, explosion-proof class, type, measurement range, accuracy, signal transmission type, power supply, process connection and electrical connection, P&ID number, installation location, piping class, piping number or equipment number, etc. shall be included. In addition, it shall also comply with the following requirements.

1 The specification of orifice plate devices shall show the input conditions required for calculation, calculation results, primary orifice element type, selected differential pressure, pressure rating, material and accessories, etc.

2 The specification of control valve shall show the process operating conditions, control requirements, calculation results, control valve type and flow coefficient (CV), nominal diameter, valve core diameter, process connection, pressure rating, material, failure action, actuator type, positioner and accessories, etc.

3 On-line process analyzers specification shall include the process streams to be analyzed, background gas compositions, operating conditions, utility conditions, technical specifications and attachments, etc.

3.5.8 In addition to complying with Article 2.6.7 of this standard, the contents of instrument panel (cabinet) specification shall also include thickness of steel plate and surface treatment procedures, etc.

3.5.9 The specification of on-line process analyzer room shall comply with Article 2.6.8 of this standard.

3.5.10 Bill of material shall list out the type, specifications and quantity of steel, wire (cable), impulse lines, air lines, heat tracing lines, conduit, valves, fittings, junction box, instrument box with or without insulation and cable tray, etc.

3.5.11 The content of DCS specifications shall comply with Article 2.6.11 and Article 2.6.15 of this standard.

3.5.12 The content of SIS specifications shall comply with Article 2.6.12 and Article 2.6.15 of this standard.

3.5.13 The content of PLC specifications shall comply with Article 2.6.13 and Article 2.6.15 of this standard.

3.5.14 The content of SCADA specifications shall comply with Article 2.6.14 and Article 2.6.15 of this standard.

3.5.15 The I/O index shall list out instrument tag number, signal transmission type, card channel or location in cabinet, measurement range, engineering unit and function such as control, alarm and trip, etc.

3.5.16 The content of the Central control room (CCR) layout shall comply with the Article 2.6.16 of this standard.

3.5.17 The flammable and toxic gas detector layout shall comply with Article 2.6.17 of this standard.

3.5.18 Instrument cable tray routing shall show cable tray layout or routing, elevation and dimension as well as cable tray's partition number, specification and quantity. For the purpose of further clarification, drawings to indicate tie-in in details should be provided.

3.5.19 Instrument electronic & pneumatic layout shall show the following:

1 Installation location and elevation of measuring element, instrument on base, transmitter, control valve, junction box, instrument box with or without insulation, instrument local panel (cabinet) or local rack.

2 The cable routings between main cable tray and field instrument as well as junction box (power distribution box), indicating the name and specifications of cable (wire), cable tray and conduit.

3 The layout, elevation and specification of instrument air supply lines between air header and air distributor or consumer, including air distribution and consumer tag number, elevation and installation location.

4 Location, elevation and specification of instrument heat tracing and water return, flushing and seal liquid point including number, elevation and installation location of instrument heat tracing distributor, heat tracing water return station, each heat tracing or flushing instrument.

3.5.20 The instrument panel (cabinet) layout shall show the location of instrument in the instrument panel (cabinet), instrument tag number, model, quantity, centerline, coordinate dimension, instrument panel (cabinet) overall dimension and color, and summary of devices in the instrument panel (cabinet).

3.5.21 The instrument panel (cabinet) wiring diagram shall show instrument panel (cabinet) input and output terminals wiring, and each wiring terminal and wiring shall be matched via properly numbering principle such as instrument tag numbers. For simple instrument wiring, direct wiring may apply.

3.5.22 Instrument impulse lines hook-up drawing shall show impulse line connection as well as type, specification, material and quantity of piping, valves and fittings.

3.5.23 Interlock diagrams shall specify the cause and effect between input and output with logic or cause & effect relation, including input, logic function, output and description, etc.

3.5.24 Sequence control logic (time sequence) diagram shall show the logic sequence of process operation, actuator and time (or condition) via logic symbology or flow chart.

3.5.25 Complex loop control narrative should describe in text the construction, calculation and function block of complex loop such as selector, cascade, ratio, split-range, override and feedforward. Chart may also applied in some cases.

3.5.26 Instrument power distribution diagram shall show the connection between power supply and consumer, including the input and output power type, voltage class and capacity of feeder, consumer number or instrument tag number, power consumption or air-break rated capacity.

3.5.27 Instrument grounding diagram shall show the grounding connection between instrument and equipment in the control room, including grounding bar configuration system, grounding cables routing and specifications, grounding wiring requirements, etc.

3.6 Electrical

3.6.1 The detailed engineering design documents for the electrical section should consist of the following:

1 Description;

2 List of electrical loads;

3 Electrical calculation sheet;

4 Cable schedule;

5 Relay setting list;

6 Electrical equipment and material list;

7 Power supply system diagram;

8 Secondary wiring principle diagram;

9 Microcomputer monitoring diagram;

10 Non-standard panel diagram;

11 Plot plan and installation drawing;

12 Classification of hazardous area in oil depot.

3.6.2 The content of description shall describe the following requirements:

1 The overview shall describe the basic design data, scope and division of design, total electrical load, annual power requirement, basic data, content of change and punchlist, etc.

2 The power supply system of oil depot area shall describe the bus connection and its normal operation, automatic devices setting and its normal operation, reactive compensation, the quantity of substations and the scope of power supply, style of substation building, the cable selection and installation.

3 The lightning protection, anti-electrostatic and grounding works should describe the lightning protection classification of buildings and structures and protection measures, classification of grounding units and way of grounding, grounding resistance requirements, engineering practice of grounding unit and anti-electrostatic installation at special locations.

3.6.3 In addition to complying with Article 2.7.5 of this standard, the content of list of electrical loads shall include the process control requirements.

3.6.4 Electrical calculation shall include load, transformer selection and reactive power compensation calculations, and the additional calculations should be performed when changes on detailed engineering design are made.

3.6.5 The cable schedule should list out the cable number, cable starting and ending points, cable model and length, cable conduit specification and length, load parameter, etc.

3.6.6 Relay setting List should list out the source data, setting point and relay protection output action type.

3.6.7 The content of electrical equipment and material take off list shall list out the following requirements:

1 The power transformation and distribution equipment shall include transformer, switchgear, node equipment at center point, reactive power compensation unit, power supply equipment and relay protection equipment, etc.

2 The field power distribution and control equipment shall include the power distribution equipment, control and operation equipment, etc.

3 The wiring equipment shall include the power cable, control cable and conductor, etc.

4 The lighting equipment shall include the lighting distribution panel, lighting fixture and control switch, etc.

5 The lightning protection and grounding equipment shall include the lightning rod, grounding electrode and grounding wire, anti-electrostatic equipment, etc.

6 The scope of vendor's supply shall be described for package equipment.

7 The materials shall include various types of steels, steel pipe, plastic pipe, copper products, aluminium products, insulating materials and fire-proof materials, etc.

3.6.8 The power supply system diagram shall show the following:

1 The single line diagram shall show the quantity and data of power feeders, the name of each substation, the electrical relation of power supply, scope of power supply and data of key equipment.

2 The content of system diagram shall include the bus, main equipment connected to the bus and their parameters, the number of secondary wiring diagram, load information, equipment tag number and capacity, and the type, specification and parameter of primary equipment, protection equipment and gauge.

3 The content of auxiliary power system diagram shall include the incoming line block diagram, feed name, element model and specification, line number and equipment list, etc.

3.6.9 The secondary wiring principle diagram should show the control, interlock and relay protection relation of electrical equipment.

3.6.10 The SCADA system should show the name and parameter of main equipment in the microcomputer monitoring system, equipment group panel and terminal strip in the panel, cable (fiber optic) to each equipment and models and specifications.

3.6.11 The non-standard panel diagram should show the primary wiring, wiring principles, disc element layout, as well as the label box, terminal strip and equipment list.

3.6.12 The plot plan and installation drawing shall show the equipment tag number, building (special structure) type and use, locating dimension and elevation, and shall also indicate the following:

1 The content of substation equipment layout shall include the substation equipment layout and installation details. Lists of equipment and materials should be attached with the drawing.

2 The content of electric schematics shall include the location of distribution and electrical equipment, electrical parameter, route and way of running the power cable and control cable to the distribution and electrical equipment, and should indicate the line number of cable section, routing parameter at special locations, etc.

3 The content of lighting diagram shall include the distribution, installation way and installation height of lighting lamp, power supply equipment and control equipment.

4 The contents of drawings of lightning protection, anti-electrostatic and grounding include distribution, installation and installation height of lightning protection, anti-electrostatic and grounding equipment, lightning protection classification of buildings (special structures), classification of grounding unit and way of grounding, grounding resistance requirements, engineering practice of grounding units and anti-electrostatic installation at special locations.

5 The detail installation drawing should show equipment dimensions, installation details, equipment bracket arrangement, bracket material specifications and detailed fabrication drawing, etc.

3.6.13 In case of change to the layout in the detailed engineering design, the explosion hazardous area zoning drawing shall be prepared in compliance with Article 2.7.10 of this standard.

3.7 Telecommunication

3.7.1 The detailed engineering design documents for the telecommunication section shall consist of the following:

1 Description;

2 Bill of equipment and materials;

3 Telephone wiring system diagram or structured cabling system diagram;

4 Wireless communication system diagram;

5 Automatic fire alarm and fire-fighting control system diagram;

6 Public address system diagram;

7 Television monitoring system diagram;

8 Intelligent card system diagram;

9 Perimeter alarm system diagram;

10 Indoor telecommunication layout;

11 Outdoor telecommunication layout;

12 Cable routing table;

13 Cable tray and cable trench plan and section drawing;

14 Telecommunication equipment layout;

15 Automatic fire alarm system and fire-fighting control cause and effect chart.

3.7.2 In addition to complying with Article 2.8.2 of this standard, the content of description shall provide requirements of construction and installation, etc.

3.7.3 The bill of equipment and materials should list according to telecommunication system category, the equipment, cable, optic cables, wire, junction box, power supply device, cable tray, bracket, explosion-proof flexible pipe, explosion-proof joint, explosion-proof pull box, fire-proof putty and various shape steel, steel pipe, steel plate, plastic pipe, etc.

3.7.4 The content of various system diagrams shall comply with Article 2.8.5 of this standard.

3.7.5 The indoor telecommunication layout shall show the building style, room partition and name, building (structure) dimension, installation location of indoor telecommunication equipment, line routing, way of routing, number, entry location and conduit description, and the list of various telecommunication equipment & materials, etc.

3.7.6 The outdoor telecommunication layout shall show the mounting location of telecommunication equipment, route of cable and optic fiber cable, way of routing, number, entry location and conduit description, and the list of various telecommunication equipment & materials, etc.

3.7.7 The cable routing lists shall list out the size, starting point, ending point, length of each cable and fiber optic cable, as well as conduit size and cable routing.

3.7.8 The cable tray and cable trench plan view and section drawings shall show the locating dimension and width of cable tray and cable trench and mounting height or depth across each individual run. The cable tray and cable trench should have in place the section drawing and list of equipment & materials. The heavy equipment affecting the routing of cable tray (trench) shall be definitely identified.

3.7.9 The telecommunication equipment layout shall show the overall dimension, installation location

and installation way of telecommunication equipment.

3.7.10 The cause and effect charts of automatic fire alarm and fire-fighting control system should show the logic relations of the fire detector, manual alarm button, input module, etc. with audible and visual alarm, controller or PLC processor, emergency broadcasting, output module, fire valve and fire pump, etc.

3.8 Architecture

3.8.1 The detailed engineering design documents for the architecture section shall consist of the following:

1 Description;

2 Calculation sheet;

3 List of engineering practices and decorations, list of doors and windows;

4 Overall plot plan;

5 Building plot plan;

6 Building elevation drawing;

7 Building section drawing;

8 Partial enlarged detail;

9 Accessory and structure details.

3.8.2 The description shall describe the building area, design service life, number of building floors, building height, fire-resistance rating, roof water-resistance grade, seismic fortification intensity, type of structure, ±0.000 indoor ground elevation corresponding to absolute elevation, etc.

3.8.3 The calculation sheet shall show calculations on energy conservation, fire control and safety evacuation according to the requirements of the project review and approval.

3.8.4 The content of list of engineering practices and decoration, and list of doors and windows shall comply with the following requirements:

1 Engineering practices shall describe the type, size, construction requirements and other special requirements of materials.

2 The list of indoor decoration shall list out the selected standard drawing collections or selected materials and engineering practices.

3 The list of material and practice should be put in place. The list may be ignored when the standard drawing collections or general building design descriptions are directly utilized.

4 The list of doors and windows shall be filled out in a sequence of doors before windows, and standard ones before non-standard ones. For application of non-standard drawing collections, the door/window elevation and way of opening shall be shown; the door/window lintel and opening dimension shall correspond to the door/window number. For application of standard drawing collections, the standard drawing collection name, material, specification, performance, color and glass requirements, etc. shall be described.

3.8.5 The overall plot plan shall show the following:

1 Number and dimension of building (special structure) contour and locating axis/characteristic axis, and relative dimensions of each building (special structure).

2 Zoning contour, zoning number and zoning drawing number.

3.8.6 The building plot plan shall show the following:

1 Plan position of building equipment and accessories, style of main structural element, uncut high window and components; north arrow at ±0.000 floor.

2 Bearing wall and column and their locating axis and their axis numbers, location, opening direction and number of internal and external doors/windows.

3 Elevation of ground, floor, stair surface, operating platform and pit, ground slope and gradient.

4 Room name or number, boundary of the ground and floor of different constructions.

5 Door/window number , lintel number.

6 Wall opening and embedded workpiece.

7 Trench location and dimension, as well as the trench elevation at starting point and ending point and slope direction in case of sloped trench.

8 Location of ground and floor drain.

9 Equipment mounting opening through the floor, location and dimension of opening for heavy equipment and pipe.

10 Location and dimension of building distortion joint and practice index.

11 Ladder position, ladder up and down arrow and number index.

12 Plan position of main structure and building construction components and details of related nodes or details index number.

13 Width of ground transportation track in factory, track centerline and axis dimensions, span and lifting capacity of bridge crane or monorail crane, and location of the steel ladder allowing access to the crane.

14 Plan positions of roof opening, equipment foundation, rain outlet, roof repair ladder, handrail, parapet, distortion joint, lightning arrester embedded workpiece, etc., roof watershed, gutter drainage slope, gradient, roof engineering practice boundary, etc.

3.8.7 The elevation drawing shall show the following:

1 Building's 4 elevations, only main elevation may be required for small buildings.

2 Facade contour and main construction, architecture component location.

3 Door/window type, as well as window number not clarified in the plot plan.

4 Elevations of eave, parapet top, outdoor grade, cantilever platform, handrail and door/window opening.

5 Outdoor decoration requirements on wall, plinth, eave, etc.

6 Outdoor ladder, repair ladder, rain shed, balcony, rainwater pipe, stack and large wall opening.

7 Total building height, auxiliary line of floor location, numbers of floor, elevation and key control elevation.

8 Axis number at both ends.

3.8.8 The building section drawing shall show the following:

1 The locations representing the overall architecture characteristics and typical construction.

2 Ground, floor, roof, ceiling, door/window, beam, column, hoisting beam, platform, ladder, pit, basement, heavy aboveground equipment foundation as well as mutual spatial relationship, and internal construction and architectural characteristics which are sectioned and seen.

3 Sectioned wall, column, axis and axis number.

4 Ground, floor, roof, window sill, door opening top, ladder platform, operating platform, pit bottom, roof beam bottom chord (or column top), crane track top, ceiling bottom, eave, parapet top elevation; elevation of finished surface of ground, floor, platform, pit bottom and ceiling bottom, etc.; elevation of unfinished surface of sill, door window opening, eave, parapet, roof.

5 External door, window, opening height, inter floor height, indoor and outdoor height differences, parapet height, total height, as well as dimensions and elevations of internal partition, internal window, opening, platform and ceiling.

6 Roof engineering practice shall indicate the engineering practice and node details index number at the sectioned location.

7 Engineering practice of ground and floor.

8 Crane's external contour and track top elevation.

9 Drainage direction, gradient and rain pipe location, roof arrangement, etc.

3.8.9 The local details shall show the facilities and components which can not be expressed in detail in the plot plan.

3.8.10 The accessory and construction details shall show the following:

1 Details of ceiling, rain shed, overhanging eave, non-standard door/window, wall opening, embedded workpiece, connecting workpiece and construction, etc.

2 Details' index number.

3 Construction material and dimension for each component, and associated axis number.

3.9 Structure

3.9.1 The detailed engineering design documents for the structure section shall consist of the following:

1 Description;

2 Bill of materials;

3 Foundation overall plot plan;

4 Artificial ground treatment drawing;

5 Foundation plot plan;

6 Foundation details;

7 Reinforced concrete structure plan;

8 Reinforced concrete structure elevation;

9 Reinforced concrete component and joint details;

10 Reinforced concrete pit structure details;

11 Equipment foundation details;

12 Steel structure plan and elevation drawing;

13 Steel construction component and joint connection details.

3.9.2 The content of description shall comply with the following requirements:

1 Design scope shall describe the main works of project.

2 Design basis shall include the detailed design contract, basic engineering design and revised documents, geotechnical engineering detailed survey report, special individual assessment report and approval, construction discipline-related minutes of meeting and correspondences, etc.

3 Design basis shall include the project geological survey report, seismic design parameters on

seismic fortification intensity in the project site, seismic fortification classification and seismic acceleration parameters, etc. as well as building site classification, ground estimation , engineering geological and hydrogeological conditions,ground frost heaving property and thaw collapse, etc.

4 The names and serial numbers shall be clearly indicated for the applicable standards.

5 The elevation and dimension shall show the absolute elevation value at ±0.000 elevation, elevation and dimension units in the drawing.

6 The content of ground scheme shall describe the following requirements:

1)For application of natural subsoils, the foundation bearing layer, foundation cushion and characteristic value of bearing capacity shall be included;

2)For application of artificial treatment ground, the pile foundation shall describe the type of pile, bearing layer at pile tip and depth of penetration into the bearing layer, characteristic value of bearing capacity per pile; for the application of other foundations, the characteristic value of vertical bearing capacity for treated ground shall be described.

7 The building (special structure) design standards and seismic fortification standards shall include the structure design service life, safety class, foundation design class, building (special structure) seismic fortification category, seismic grades of reinforced concrete and steel structures, concrete structure durability requirements and masonry structure construction quality control class.

8 The building (special structure) load setting shall include the max., service load standard value of permanent load, variable load, accidental load and load at special locations.

9 The design calculation procedures shall include the name, revision and preparation company of the procedures adopted in the overall structure calculation and other calculation.

10 Material selection shall describe the general requirement on material selection , type , specification and property of selected structure materials , and appropriate product standard , etc. The special materials for special components shall be particularly clarified.

11 The foundation works shall describe the following:

1)General procedures for excavation of foundation trench and requirements on foundation trench excavation, inspection of foundation subsoil and backfill;

2)Artificial ground treatment construction and inspection requirements;

3)Construction requirements of secondary grouting layer;

4)Embedded workpiece construction requirements;

5)Requirement on distribution and observation of settlement observation point.

12 The concrete structure works shall describe the following:

1)Min. thickness of concrete cover of longitudinal tensioned bar;

2)Requirement on reinforcement joint;

3)Requirement on the method of reinforcement extension, etc.;

4)Concrete additive application requirement;

5)Curing requirements of cast-in-place concrete bearing structures;

6)Installation requirement for refabricated components;

7)Requirements on connection of prefabricated components, connection of prefabricated component to lamination layer;

8)Lifting operation requirements for prefabricated component;

9)Prestressed component stretching end and fixed end structure requirement and engineering

practice, anchor type and protection requirements, etc. as well as construction, arrangement and grouting requirements on the duct of prestressed component for application of post-tensioning method;

10)Tension control stress, tension sequence, tension condition, necessary tension test requirements, etc. of prestressed structures;

11)The building (special structure) concrete requiring anti-permeability, such as water tank, basement, etc., shall describe the anti-permeability class and leak test requirements;

12)The anti-freeze class requirements for anti-freeze design works;

13)The anti-floating measures to deal with possible floating during construction shall be described.

13 The steel structure works shall describe the requirements of the steel structure connection, weld, high-strength bolt, steel structure beam and column connection, steel grating installation and opening, etc.

14 The steel structure corrosion-proof protection and painting requirements shall describe the corrosion grade, base course derusting grade, service life of protective layer and thickness of dry paint film for each layer and total thickness.

15 The fire-resistant protection for steel structure shall describe the fire endurance of fireproof paint, scope of fire-resistant layer protection provision and fire-resistance engineering practice.

16 The common practices and standard component and structure drawing collections applied for structure design shall show the names and serial numbers of drawing collections.

17 The building (special structure) construction quality and acceptance requirements shall include the applicable codes and standards, and describe the inspection methods and requirements on structure performance inspection of special components.

3.9.3 Bill of materials shall list out the specifications, models, weights and material requirements of main steels, as well as the cement grades and weights.

3.9.4 The general plot plan of foundation shall show the depot's battery limit's angular coordinate, foundation serial numbers, construction north, relative dimensions for the related foundations as well as the dimensions relative to the depot battery limit, trench starting point, break-point location and trench width, section location, trench cover and lintel model, and construction requirements. Furthermore, the list of building (special structure) foundations shall be provided.

3.9.5 The artificial ground treatment drawing shall show the following:

1 Pile layout, locating dimension, type and quantity, pile top elevation, connection of pile to pile cap, bearing layer at pile tip and depth of penetration into the bearing layer, characteristic value of bearing capacity of each pile, pile concrete strength grade, type of reinforcement, thickness of concrete cover, pile forming of pile foundation, test pile, construction, type of pile extension and pile inspection, etc. as well as cast-in-place pile formwork schematic, distributing bar drawing, standard drawing collection number, test pile locating layout and north arrow;

2 Treatment scope and depth of composite foundation, displacement pile layout, material, property requirements, structure details, characteristic value of bearing capacity, distortion control value and inspection requirements;

3 Treatment scope of dynamic compaction and distribution of hammering points, effective consolidation depth, compaction energy, number of compaction, ramming times, interval time,

characteristic value of bearing capacity for treated foundation, distortion control value and inspection requirements.

3.9.6 The foundation plot plan shall show the following:

1 Foundation and foundation beam plan position;

2 Foundation serial numbers, dimension and relation to the axis;

3 Construction North;

4 Arrangement and location dimensions of longitudinal and lateral axis and column grid, location and dimension of wall beams, serial numbers of pile caps and foundation beams, pile serial numbers, location of bottom constructional columns, location and elevation of settlement observation point, reserved holes at±0.000 elevatic, location, dimensions and elevations of embedded pipes, trench directions and locating dimensions, slope directions and trench bottom elevations, etc.

3.9.7 The foundation details shall show the following:

1 Describe the Construction North and axis, with the same orientation as that in the foundation plan view.

2 Describe the concrete strength grade, reinforcement grade, thickness of reinforcement cover, absolute elevation corresponding to ±0.000, foundation bearing layer, requirements on material of foundation embedded bolts and embedded workpieces, requirements on material and thickness of secondary grouting layer at the steel column foundation top, ground treatment measures and construction requirements, etc.; wherever the groundwater or foundation soil has corrosion impact on the foundation, the construction practice on fulfillment of corrosion protection of foundation surface and cushion shall be described.

3 For the non-reinforced spread foundation, the section, foundation ring beam and damp-proof course location shall be shown, and the total dimension, individual dimension, elevation and axis relations shall be shown.

4 For the spread foundations and pile foundation caps, the plot plan and section and distributing bar schematics, the total dimension, individual dimension, elevation, axis relations and foundation cushion shall be shown.

5 For the strip foundations under columns or cross-shaped foundations, the plan view and section and reinforcement schematics shall be shown, indicating the total dimension, individual dimension, elevation, axis relations and foundation cushion.

6 For the raft foundations and box foundations, the location of bearing wall and column shall be shown; wherever the post-cast strip is required, the plan position and the structure details shall be shown; for the box foundation and basement foundation, the reinforced concrete wall plan, section and its distributing bar shall be plotted; for application of many or complicated reserved holes and embedded workpieces, the formwork drawing shall be prepared.

7 For application of embedded anchor bolts and steel embedded workpieces in the foundations, the details shall be shown, indicating the requirements on material of embedded bolt and embedded workpiece; for use of standard drawing, the serial numbers of the standard drawing collection and selected models shall be provided.

3.9.8 The plot plan of reinforced concrete structure shall show the following:

1 Frame beam, column, ladder formwork drawing and serial numbers, dimension relative to the axis, beam section dimension.

2 Equipment foundations on the slab, reserved holes and under-slab suspended cranes and its serial numbers, dimensions and relations with the axis, crane capacity and available construction measures.

3 Graphic, serial numbers, dimension and elevation of slab face, slab bottom, beam bottom, beam size and column side, and relation with the axis.

4 Slab thickness.

5 Section, dimension and elevation at elevation change location of floor and roof.

6 Relation and construction treatment of slab, beam, wall and ring beam.

7 Types, serial numbers, diameters, distances, locating dimensions and distribution bar of different types of reinforcement steel used for cast-in-place slab.

8 Span direction, slab serial numbers, quantity and slab bottom elevation of prefabricated slab, dimension and location of reserved hole, location and model of prefabricated beam and hole lintel, beam bottom elevation.

9 Flooding structure at opening of roof slab, reinforcing measures around the slab opening.

3.9.9 The reinforced concrete structural elevation shall show the vertical arrangement of components along the axis, appropriate structural elevation and locating dimensions.

3.9.10 The reinforced concrete components and joint details shall be shown according to the columns, beams, cant beams, stairs and joint details, complying with the followings:

1 The column formwork drawing shall show the column's overall dimensions, section dimensions, bracket dimensions, relation with the axis, elevations of column top, bracket top surface and column bottom, location and specification of embedded workpieces and embedded steel bar; distributing bar longitudinal profile shall show all reinforcements, reinforcement serial numbers and overlapping lengths; the distributing bar profile shall show the reinforcement serial numbers, materials, diameters and quantity of steels.

2 The precast beam formwork drawing shall show the beam's overall dimensions, location, dimension and serial numbers, etc. of reserved hole and embedded workpiece; the cast-in-place beam longitudinal profile shall show the location of slab and secondary beam, support, beam pad dimension and relative dimension to the axis, etc.; the beam longitudinal profile shall show the beam reinforcement, serial numbers at both ends or bending of reinforcement, overlapping length and length of penetration into the support; the beam profile shall show the serial numbers, material, diameter and quantity of all reinforcements; the reinforcement stirrup drawing shall show the serial numbers, diameter and distance on the longitudinal profile.

3 The inclined beam shall be shown according to the slope direction, showing the horizontal projection, height difference and elevation at both ends, etc.

4 The ladder shall show the axis relation of the stair with the column grid or bearing wall, the starting point, ending point and serial numbers at each stair flight, serial numbers and section size of stair beam and stair column at the stair intermediate platform, and local distributing bar, serial numbers, diameter and quantity of reinforcement at the stair flight slab.

5 The joint details shall show the cast-in-place reinforced concrete structure connection joints, and plot the structure details; for the precast assembly structure connection joints, plot the plan view and profile details on the beam, column and wall tie bar, indicating relative dimension, component designations, connecting materials, specification, model, property and quantity of additional

reinforcements (or embedded workpieces), and describing the way of connection and requirements on construction, installation and post-cast concrete, etc. For use of standard drawing, the standard drawing collection connection joints and selected model shall be shown.

3.9.11 The content of details of reinforced concrete pit structure shall show the following requirements:

1 The formwork drawing shall show with the plot plan and section drawing the overall dimensions of tank wall, tank bottom and tank roof, dimensions at each location, post-cast strip, deformation joint, axis relation, water stop material and style, as well as the elevation of tank bottom, tank roof and ground, location and specifications of maintenance ladder, reserved hole, embedded sleeve, anchor bolts and embedded workpieces; in case of change to the elevation of tank bottom or sump at the tank bottom, the location and detail dimensions shall be shown; for equipment foundation at tank bottom, the plan position, foundation strut dimension, embedded workpieces at strut top and sliding end, etc. shall be shown.

2 Wherever the tank roof is equipped with prefabricated cover, the cover, beam arrangement, serial numbers, opening, embedded workpiece and steel handrail distribution, etc. shall be shown in the layout.

3 The distributing bar drawing shall show the types, diameters, quantities and styles of reinforcement used in the tank wall, tank bottom and tank roof, as well as reinforcement break points, overlapping locations and lengths, and should show the reinforcement steel serial numbers.

4 The detailed drawings shall show the concrete strength class, type of reinforcement, thickness of concrete cover, ground treatment measure, concrete anti-seepage class, antifreezing class, water seal requirement, anti-corrosion measures and construction requirements, etc.

5 The extra constructional reinforcements shall be shown at the corner of water ditch and pit.

3.9.12 In addition to complying with the Article 3.9.7 of this standard, the equipment foundation details shall show the following:

1 Location, size, buried depth, exposed length and thread length of reserved anchor bolts in the vertical/horizontal vessels and pumps.

2 Location and size of reserved anchor bolt hole in the compressor foundation, location and specification of embedded workpieces, location, size and elevation of pits, trenchs and holes in the foundations, scope and thickness of secondary grouting layer at the foundation top, and foundation position line.

3.9.13 The steel structure plan and elevation views shall show the following:

1 The plan layout for each floor shows each component's plan position, types and ways of attachment to the associated elements, the element serial numbers., position of steel ladder and way of climbing up and down, coverage of steel handrail and way of fabrication, coverage, types and fabrication of platform, size and location of opening in the platform, locating size and serial numbers of equipment base, location and fabrication of steel element's corrosion-protection and fire-resistant part, surface color of steel elements, construction quality and acceptance, etc.

2 The elevation layout of each axis shows the element serial numbers, vertical relation, elevation, type of elements in each axis as well as the way of attachment to the associated elements.

3.9.14 The steel structure elements and connection details shall show the element connection construction, element serial numbers., the ways of connection, relative dimensions and connection's position in the structure.

3.10 Heating and ventilation

3.10.1 The detailed engineering design documents for the heating and ventilation section shall consist of the following:

1 Description;

2 Bill of equipment and materials;

3 Bill of materials;

4 Plot plan of heating, ventilation, air conditioning;

5 Heating system drawing;

6 Ventilation (air conditioning) section drawing;

7 Ventilation (air conditioning) system drawing.

3.10.2 In addition to complying with Article 2.11.2 of this standard, the content of description shall provide the system pressure test requirements, special requirements on commissioning and operation, construction requirements and applicable construction standards.

3.10.3 Bill of equipment and materials shall list out the name, specification, quantity, main technical conditions, supply scope and special requirements of equipment, valves, accessories, etc.

3.10.4 The bill of materials shall list out the specifications, classification, material, quantity and technical requirements of pipe, pipe fittings, profiles, insulation materials and anti-corrosion materials, etc.

3.10.5 Plot plan of heating shall show the arrangement of all headers, branches, risers, trenches transferring the heating medium from the inlet to the outlet as well as radiators, main valves, expansion pieces, fixed brackets, and show the location of heating medium inlet and outlet, quantity of radiators, etc.. Indicate the locating dimensions of equipment, pipes, accessories and valves to be located; indicate the construction north in the ground floor layout.

3.10.6 Plot plan of ventilation (air conditioning) shall show the location and number of ventilator (air conditioner), parts and air ducts, as well as the diameter of air duct and locating dimension of pipe, etc.; the construction north shall be shown in the ground floor layout.

3.10.7 The heating system drawing shall show the heating pipe's nominal diameter, radiator elevation, trench pipe elevation, header elevation, horizontal header slope and direction in addition to the content and spatial relation as required in the heating plot plan.

3.10.8 The ventilation (air conditioner) section drawing shall show the number, locating dimension and elevation of ventilator (air conditioner), parts and air ducts, as well as the elevation and size of related buildings.

3.10.9 For the purpose of further clarification about complicated ventilation (air conditioner) system, the ventilation (air conditioner) system drawing should be prepared which shall show all contents and space relations in the plan view, as well as the pipe nominal diameter and elevation, etc.

3.11 Chemical analysis

3.11.1 The detailed engineering design documents for the chemical analysis section shall consist of the following:

1 Description;

2 List of lab test;

3 List of lab instruments;

4 List of general materials;

5 Lab layout;

6 Pipe installation drawing.

3.11.2 In addition to complying with Article 2.12.2 of this standard, the content of description shall provide the applicable standards on chemical analysis pipe construction and acceptance, instrument and pipe installation requirements.

3.11.3 The content of the list of lab test shall comply with Article 2.12.3 of this standard.

3.11.4 The content of the list of lab instruments shall comply with Article 2.12.4 of this standard.

3.11.5 The content of the list of general materials shall comply with the Article 2.12.5 of this standard.

3.11.6 In addition to complying with the Article 2.12.6 of this standard, the content of the lab layout shall show the abbreviation and designation of each lab instrument.

3.11.7 The pipe installation drawing shall show the locating dimension and elevation of pipe, valve, pipe accessory, instrument, number and locating dimension of pipe bracket; the pipe number, nominal diameter, etc. shall be indicated.

3.12 Fire-fighting

3.12.1 The detailed engineering design documents for the fire-fighting section shall consist of the following:

1 Description;

2 List of fire-fighting process equipment;

3 Pipe list;

4 Bill of materials;

5 Fire-fighting equipment data sheet;

6 Fire-fighting piping & instrument diagram;

7 Fire-fighting equipment layout;

8 Fire-fighting piping layout;

9 Building (special structure) pipe installation drawing;

10 Building indoor fire-fighting sprinkler layout.

3.12.2 In addition to complying with Article 2.13.2 of this standard, the content of description shall provide the requirements on procurement, construction, installation, inspection, acceptance, commissioning, field management and operation maintenance.

3.12.3 In addition to complying with Article 2.13.5 of this standard, the list of fire-fighting process equipment shall provide the scope of equipment supply and applicable standards.

3.12.4 In addition to complying with Article 2.13.8 of this standard, the content of pipe list shall show the pipe testing pressure, purging requirements, pipe inspection class, etc.

3.12.5 In addition to complying with Article 2.13.9 of this standard, the content of the bill of materials shall show the specification, quantity and weight of profile steel, pipe fittings, flange, fastener as well as technical requirements on valve and flange.

3.12.6 The content of list of fire-fighting equipment data shall comply with Article 2.13.10 of this standard.

3.12.7 In addition to complying with Article 2.13.11 of this standard, fire-fighting piping & instrument diagram shall show the following:

1 Startup/shutdown, venting, blowdown, sampling, bypass, flushing and other auxiliary process pipes.

2 All pipes, valves and pipes, equipment attachments, including metal hose, flexible hose, filter and non-standard pipe fittings, etc.

3 Indicate the reducing symbol in case of change to pipe diameter, and indicate the updated pipe nominal diameter.

4 Type of heat tracing pipe and requirement of pipe heat insulation.

5 Specifications and number of equipment's safety attachment.

6 Provide the detailed design parameters on equipment and building as ordered.

3.12.8 The content of fire-fighting equipment layout shall comply with Article 2.13.13 of this standard.

3.12.9 Fire-fighting pipe layout shall show the direction, number, location, flow in and out orientation, elevation, etc. of all fire-fighting pipes in the equipment layout, as well as installation position of pipe fittings, valve, fire hydrant, foam hydrant and pump adapter. For the purpose of further clarification, the appropriate sectional drawing, detail and perspective drawings shall be prepared.

3.12.10 The building (special structure) pipe installation drawing shall show the overall dimensions of fire-fighting process equipment and building (special structure), internal pipe location, diameter, medium and elevation as well as location, medium flow, diameter and elevation of external connecting pipe. For the purpose of further clarification, the appropriate sectional, detail and perspective views shall be prepared.

3.12.11 The building indoor fire sprinkler layout shall comply with Article 2.13.17 of this standard.

3.13 Water supply and drainage

3.13.1 The detailed engineering design documents for the water supply & drainage section shall include the following:

1 Description;

2 List of process equipment;

3 Pipe list;

4 Bill of materials;

5 Process equipment data sheet;

6 Process flow diagram;

7 Piping & instrument diagram (P&ID);

8 Elevation diagram;

9 Equipment layout;

10 Pipe and equipment layout;

11 Special structure pipe installation drawing;

12 Building indoor water supply and drainage system drawing.

3.13.2 In addition to complying with Article 2.14.2 of this standard, the content of description shall provide the following:

1 Implementation of basic engineering design approval and processing considerations;

2 Process technology and automation control level, main building (structure) and auxiliary facilities, operating temperature, operating pressure, flow rate and main stream property control indicators and control schemes, etc.;

3 Selection of equipment and piping accessories, well and pipe foundation, pipe corrosion protection, heat insulation requirements and construction descriptions;

4 Procurement, construction, installation, inspection, acceptance, commissioning , field management and production maintenance requirements as well as acceptance and startup procedure descriptions;

5 Applicable codes and standards on design and construction.

3.13.3 In addition to complying with Article 2.14.3 of this standard, the list of process equipment shall provide the scope of equipment supply and applicable standards.

3.13.4 In addition to complying with Article 2.14.4 of this standard, the content of pipe list shall also indicate the pipe testing pressure, purging requirements, pipe inspection class, etc.

3.13.5 The bill of materials shall show the specification, quantity and weight of profile steel, pipe fittings, flange, fastener and cement as well as the applicable standards on valve and flange in addition to compliance with Article 2.14.5 of this standard.

3.13.6 The content of the process equipment data sheet shall comply with the Article 2.14.6 of this standard.

3.13.7 In addition to complying with Article 2.14.7 of this standard, the process flow diagram shall be further detailed on the basis of basic engineering design.

3.13.8 In addition to complying with Article 2.14.8 of this standard, piping & instrument diagram (P&ID) shall show the following:

1 Startup/shutdown, venting, blowdown, sampling, bypass, flushing and other auxiliary process pipes;

2 All pipes, valves and pipes, equipment attachments, including metal hose, flexible hose, filter and non-standard pipe fittings, etc.;

3 In case of change to pipe diameter, the reducing symbol and the updated pipe nominal diameter shall be indicated;

4 Type of heat tracing pipe and requirement of pipe heat insulation;

5 Number, location, type and structure of sampling point;

6 Specification and number of equipment safety attachment;

7 Provide the detailed design parameters on equipment and building based upon the purchase order.

3.13.9 In addition to complying with Article 2.14.10 of this standard, the elevation diagram shall be provided for sludge treatment, recycle water treatment, scum treatment, etc.

3.13.10 The content of the equipment layout shall comply with Article 2.14.11 of this standard.

3.13.11 The pipe and equipment layout shall show in the equipment layout the direction, diameter, number, location, and elevation of all water supply and drainage pipes, as well as installation position of valve and pipe fittings, valve, locating dimension of pipe rack, pipe sleeper, pipe trench, cable trench and drainage ditch. For the purpose of further clarification, the appropriate sectional, detail and perspective drawings shall be prepared.

3.13.12 The building (special structure) pipe installation drawing shall show the overall dimensions of process equipment and building (special structure), internal pipe location, diameter, medium and elevation as well as location, medium flow, diameter and elevation of external connecting pipe. For the purpose of further clarification, the appropriate sectional, detail and perspective drawings shall be prepared.

Explanation of wording in this standard

1 Words used for different degrees of strictness are explained as follows in order to mark the differences in implementing the requirements of this standard.

1)Words denoting a very strict or mandatory requirement:

"Must" is used for affirmation, "must not" for negation.

2)Words denoting a strict requirement under normal conditions:

"Shall" is used for affirmation, "shall not" for negation.

3)Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:

"Should" is used for affirmation, "should not" for negation.

4)"May" is used to express the option available, sometimes with the conditional permit.

2 "Shall comply with..." or "shall meet the requirements of..." is used in this standard to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.