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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	BASIC DESIGN PACKAGE (PROJECT STANDARDS AND SPECIFICATIONS)	

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SCOPE

This Project Engineering Standard defines the Basic Design Package requirements for general chemical industries, which is to be prepared by engineers. The purpose of this Project Engineering Standard is to define the technical requirements for common design, fabrication, construction, repair and replacement in industries. It is also including maintenance and modification of existing equipment and facilities, and new facilities and equipment.

DEFINITIONS AND TERMINOLOGY

Flow diagram - The diagrammatic representation of the structure of a system illustrating physical and information flows between compartments

Heat exchanger - A device built for efficient heat transfer from one medium to another. The media may be separated by a solid wall, so that they never mix, or they may be in direct contact.

Instruments - Equipments for measuring, recording, or controlling

Material balance (also called a mass balance) - An application of conservation of mass to the analysis of physical systems. By accounting for material entering and leaving a system, mass flows can be identified which might have been unknown, or difficult to measure without this technique.

Piping and instrumentation diagram/drawing (P&ID) - A diagram in the process industry which shows the piping of the process flow together with the installed equipment and instrumentation.

Refinery - An industrial plant for purifying a crude substance

Utility - A facility composed of one or more pieces of equipment connected to or part of a structure and designed to provide a service such as heat or electricity or water or sewage disposal.

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SYMBOLS AND ABBREVIATIONS

<u>SYMBOL/ABBREVIATION</u>	<u>DESCRIPTION</u>
APC	Advanced Process Control
API	American Petroleum Institute
BEDD	Basic Engineering Design Data
BOD ₅	The 5 Day Biological Oxygen Demand at 20 °C
COD	The Total Chemical Oxygen Demand
DCS	Distributed Control System
HVAC&R	Heating , Ventilation , Air Conditioning Cooling & Refrigeration
NPSH	Net Positive Suction Head
PFD	Process Flow Diagram
P&ID _s	Piping & Instrumentation Diagram

UNITS

This Standard is based on Units of the design country, except where otherwise specified.

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BASIC DESIGN PACKAGE FOR ALL UNITS

General Design Data

General information

This shall include the following items where required:

- numbering system;
- basis of design including Units design and normal capacities;
- specifications and properties of feed, raw materials and products;
- battery limit conditions for various incoming / outgoing streams;
- set of design calculations (this information shall be prepared in a separate volume and be attached to the basic design package);
- material general specifications;
- storage tanks, vessels, heat exchangers, heaters, etc. design criteria;
- driver's selection philosophy;
- control philosophy;
- product loading, storage and dispatch philosophy;
- other miscellaneous general requirements.

Basic engineering design data

This shall provide the necessary basic information required for the basic design of the facilities and shall contain the following information:

- standards and codes for design;
- utility information;
- site condition information;
- regulations concerning environmental pollution (air, water disposal, noise, etc.);
- equipment including instrumentation and electrical general design information;
- other requirements such as general design information for buildings, insulation, painting, fire proofing, etc.

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Complex/Plant material balance

This shall provide the overall feed and products material balance in the complex/plant. The data shall also be shown on the block flow diagram which shall be prepared by the basic designer.

Utility summary tables

The maximum estimated utility requirements in summer and winter cases shall be tabulated for whole complex/refinery.

The utility services to be considered are electric power, steam, condensate, boiler feed water, potable (drinking) water, fire water, plant (service) water, raw water, cooling water, sea water, fuel gas, fuel oil, natural gas, instrument and plant air, inert gas, nitrogen, etc. Special requirements such as purging nitrogen, plant air for regeneration and decoking, etc. shall be provided

Flare load summary tables

Gas and liquid flow rates to be routed to the flare or blow down system shall be tabulated for each failure and each safety relief valve.

Effluent summary tables

All gaseous and liquid effluents showing quantities and qualities of impurities which are object of control (sulfur, phenol, oil, BOD5, COD, etc.) shall be tabulated to facilitate determining the environmental impact of the project.

Winterizing & heat conservation and insulation data

Design basis for winterizing and heat conservation shall be provided and a table indicating the basis of selection of tracer size and number for various pipeline sizes and fluid temperatures in the required winterizing temperatures shall also be presented.

Base data to select insulation thickness such as ambient temperature, wind velocity, insulation material and thermal conductivity, etc. shall be provided. Insulation thickness tables for selection of hot insulation, personnel safety, cold insulation and other purposes shall also be presented.

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Safety

The following requirements shall be provided:

1. Specifications, fire rating and identification of areas for fire proofing of steel structure and equipment.
2. Recommendation for fire-fighting facilities required for process Unit(s) and storage areas including rate of water/foam required, cooling system, deluge valve requirements and identification of the areas which require it.
3. Recommendation for fire fighting facilities as well as provision of blast proof walls and/or roof for control room.
4. Recommendations for handling/storage of various chemicals, catalysts, hazardous materials etc.
5. Number and location of safety showers, eye washes, fire hydrants, etc.
6. Proposed methods of fire-fighting for different types of fires.
7. Any other specific safety requirement.

Resins, chemicals, solvents and catalysts

1. The following information shall be prepared for each catalyst, packing and solid absorbent employed in the process:
 - service;
 - name or designation;
 - acceptable suppliers;
 - volume required;
 - density;
 - pellet or grain size and shape;
 - design life;
 - regeneration characteristics.
2. The following information shall be provided for all resins, chemicals, additives, solvents and inhibitors employed in the process:
 - name or designation;
 - initial fill quantity;

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- annual consumption;
- physical properties;
- loading, unloading and make up procedures;
- shelf life (if any);
- any specific warehousing requirement.

Hazardous area classification

It shall indicate the sources of hazards and the extent of hazardous areas, providing area classifications for the selection of electrical equipment.

Licensor's proprietary items

Sufficient process design data such as heat and material balance tables, required calculations and mechanical design data shall be supplied so as to perform detail design and procure the items from Licensor's approved manufacturers.

Licensor's standard engineering specifications and drawings for the detailed design of the specific Unit shall be provided. The Licensor shall supply these specifications and drawings as applicable to particular sections of the Unit. The specifications and drawings shall cover details or practices not given in the engineering procedures and specifications supplied by the Company.

Project Specifications

Basic design package shall include all engineering standards and specifications and drawings applicable to the various parts of the project. The engineering standards/specifications shall be provided to define the basic requirements for basic design and engineering, Vendor selection, procurement, manufacturing, inspection and installation of the equipment and materials.

For the Licensed Units, the specific project engineering standards shall be provided by the Licensor together with the process design specifications. Where required, specifications provided by the Licensor shall be adhered to the project general specifications by the basic engineering designer.

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Project specifications shall cover but not be limited to the following:

- fired heaters, including steam boilers, waste heat boilers, incinerators and all kinds of furnaces;
- storage tanks, including all types of tanks, spheres, sumps and basins;
- vessels, including all types of the vessels, towers, reactors, separators, and fractionators. The specifications for the internal parts of the vessels and towers such as trays, packings, distributors, etc. shall also be included in this section;
- heat exchangers, including all types of the heat transfer equipment such as process to process heat exchangers, coolers, double pipe heat exchangers, reboilers, chillers, plate type heat exchangers, condensers, etc.;
- machinery, including all types of compressors, turbines, blowers and pumps (e.g., rotary, reciprocating, centrifugal, etc.);
- electrical, including all electric motors, cables, switches, transformers, generators, lighting, telecommunication, etc.;
- instrument, including Distributed Control System (DCS), and all instrumentation systems and equipment such as alarms and shut-down systems, analyzers, transmitters, differential pressure elements, thermometers, thermocouples, level gages, pressure gages, control valves, measuring devices, cables, computer, etc.;
- piping, including piping material, classification, lay-out, fittings, valves, etc.;
- insulation, including project required insulation thickness tables and general specifications;
- painting;
- civil, including specifications for concrete, paving, stairs, platforms, structures, buildings, site preparations, rough gradings, foundations, etc.
- HVAC&R, including air conditioning and refrigeration general specifications and basic design data (e.g., room temperature, humidity, etc.);
- miscellaneous, including all project specifications for package equipment, welding, buildings, safety, noise, etc. not included in the above mentioned specifications.

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Manuals

Basic engineering designer should prepare the following preliminary manuals if required by the Company. Each manual shall be provided in an individual bound volume apart from the basic design package.

Operating manual

The operating manual shall include and outline of start-up, shut-down and alternative operations. It shall also indicate emergency procedures covering utility failures and major operating upsets. In addition, all safety procedures, catalyst regeneration instructions and process descriptions in the all operation modes shall be included.

Laboratory manual

The laboratory manual shall include the following:

1. Laboratory equipment:
 - equipment list;
 - basic specifications.
2. Laboratory building:
 - building plot plan;
 - equipment location diagram;
 - utility distribution diagram.
3. Analytical method for:
 - raw materials;
 - chemicals;
 - process control;
 - products;
 - catalysts;
 - water impurities.
4. Instructions for sample taking and its frequency.

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Maintenance manuals

Maintenance manuals shall include:

- particular emphasis on preventive maintenance;
- maintenance instructions for each equipment, including specific types of lubricant/grease required;
- periodicity of major shutdowns for regular overhaul / maintenance;
- any other special maintenance procedure.

Test run procedure manual

The manual shall include details of performance test runs and other aspects of commissioning such as:

- operating data to be recorded by the Company in the log book;
- sampling method;
- analytical methods;
- methods of calculations;
- interpretation and measuring of parameters during the test;
- methods of taking operating data;
- methods of evaluating the Unit performance.

Drawings

Flow diagram legend & general notes

Flow diagram legend and general notes shall be prepared to cover all legends / symbols to be used in the engineering documents. If the legends and/or symbols can not be integrated and indicated on one flow diagram, a specific project document shall be provided to cover all required legends, symbols and general notes.

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Complex/Refinery plot plan

A preliminary plot plan shall be provided to show layout of control room(s), process Unit(s), utility Unit(s) offsite facilities, tankage, loading and unloading facilities and other buildings, basins, etc. throughout the complex / refinery. The plot plan shall be prepared in accordance with the safety, operation and maintenance requirements instructed by the Company's engineering standards and approved by the Company.

Block flow diagram

Overall simplified schematic diagram of the all Units showing all process Units, utility and offsite facilities shall be provided. The complex/refinery terminal material balances shall also be shown.