

SPD0007ERN

PROCESS DESIGN MANUAL

BASIC DESIGN PACKAGE

REV.: 2

DATE: 2013.07.09



**SAMSUNG
ENGINEERING**

SAMSUNG ENGINEERING CO., LTD.

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page i of ii

Contents

1. SCOPE	1
2. FORMAT	1
2.1. Covers and Size	1
2.2. Titles	1
3. CONTENTS OF THE BASIC DESIGN PACKAGE	2
3.1. Process design basis	2
3.2. Process description	2
3.3. Basic engineering design data (BEDD)	3
3.4. Process flow diagrams (PFDs) with Heat and Material Balance	3
3.5. Equipment list	4
3.6. Equipment data sheets	4
3.7. Instrument process data	5
3.8. Conceptual Plot plan	5
3.9. Piping and instrumentation diagrams (P&IDs)	5
3.10. Utility summary & Utility Diagram	6
3.11. Tie-in diagrams (if necessary)	6
3.12. Material Selection Diagram	6
3.13. Chemical requirements	6
3.14. Catalyst requirements	7
3.15. Effluents data	7
3.16. Laboratory Manual	8
3.17. Standard Analytical Method	8
3.18. Operating Guide & Manual	8
3.19. General specifications and standard drawings	8
3.19.1. Piping classifications	9
3.19.2. Insulation thickness table	9

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN
DATE: 2013.07.09		REV.: 2 Page ii of ii

3.19.3. Hazardous area classification 9

4. ARRANGEMENT OF PACKAGE..... 9

5. Tables and Figures 10

5.1. Table 4-1 Contents of Basic Design Package 10

5.2. Figure 2-1. Typical Arrangement of Titles 12

6. REVISION HISTORY 13

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page 1 of 13

1. SCOPE

This [Basic Design Manual](#) defines the requirements for the Basic Design Package. The package is to be prepared by the basic design contractor. The contractor formats the package, provides its contents, and provides the arrangement of the books and blank forms. The client's requirements, if any, shall take precedence over the requirements presented in this manual.

2. FORMAT

2.1. Covers and Size

The Basic Design Package shall be presented in the form of a book of one or more volumes. The format shall essentially conform to the SECL proposal standards. The following format shall be applied to the basic design package with minimal variation from the proposal standards:

Size of covers:	22.5 cm x 30 cm (bound on the 30 cm side)*
Size and type of back covers:	8 cm maximum thickness and integral with covers*
Color of covers and back covers:	Later
Color of title on covers and back covers:	Black
Form of title character:	Later
Printing format:	Later

2.2. Titles

The basic design package shall be called: Basic Design Package. The titles shall include:

- (1) Project designation
- (2) Client Company name
- (3) Refinery/plant name or location
- (4) Plant or unit name and number

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page 2 of 13

- (5) Volume number, if more than one volume
- (6) Contractor's name and logo, i.e., SECL
- (7) [Date of package completion](#)
- (8) [Revision number](#)

The typical arrangement of titles on the cover page shall be as shown in Fig. 2-1.

3. CONTENTS OF THE BASIC DESIGN PACKAGE

The Basic Design Package shall be sufficiently comprehensive to allow a third-party contractor to complete the detailed design engineering, [and shall consist of the following contents](#) (some sections may be deleted in accordance with the project scope and the client's requirements):

3.1. Process design basis

[The process design basis shall contain the following information:](#)

- (1) Reference number of client's specifications [and special requirements](#)
- (2) Feed source, [composition, battery limit T&P \(operating and design\), and feed capacity](#)
- (3) Products: [Capacities and specifications, battery limit T&P](#)
- (4) Other requirements of process design

[For additional details on the Process Design Basis, please refer to SPD0013ERN.](#)

[Process design basis can be included in "Process Description" without section.](#)

3.2. [Process description](#)

The process description shall provide a clear understanding of the process being designed. The following subjects shall be provided with sufficient detail to help clarify the minimum design requirements:

- (1) Feed(s) and product(s) characteristics
- (2) Key properties and flow rates of feed(s), product(s) and other main process streams

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page 3 of 13

- (3) Chemical changes and changes in state
- (4) Internal arrangement of columns and vessels
- (5) Surge [volume requirements for various vessels](#)
- (6) [Pump overcapacity factors for various applications](#)
- (7) [Stream](#) temperatures & pressures at the battery limits and points where important changes take place
- (8) Instrumentation [requirements](#)
- (9) [Equipment](#) operating limitations and [alternative means of operation](#)
- (10) Hazards [pertinent](#) to the process
- (11) Catalyst poisons
- (12) Catalyst volume, space velocity, important properties, maximum bed height, and regeneration methods.
- (13) Brief description regarding start-up, shut-down and emergency operations

3.3. Basic engineering design data ([BEDD](#))

[The BEDD](#) shall provide the necessary basic information required for the design of the facilities and shall contain the following information:

- (1) Standards and codes for design
- (2) Utility information
- (3) Site conditions information
- (4) [Environmental regulations \(air pollution, waste water disposal, hazardous waste disposal, noise, etc.\)](#)
- (5) Equipment design information
- (6) Instrumentation design information
- (7) Other information, i.e. building, insulation, painting, and fire-proofing requirements, etc.

[For additional details on the BEDD, please refer to SPD0008ERN.](#)

3.4. Process flow diagrams (PFDs) [with Heat and Material Balance](#)

The following information shall be shown on the process flow diagrams for each design case.

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page 4 of 13

(1) [Title block and pertinent information](#)

(2) Major items of equipment, piping and instrumentation

(3) Operating temperatures and pressures

(4) [Duties](#) of heat exchangers, coolers and fired heaters

(5) Key properties, [temperatures](#), [pressures](#), and flow rates of major streams

(6) [Equipment names, numbering, and key information](#)

[For additional details on the Process Flow Diagrams, please refer to SPD0015ERN.](#)

3.5. [Equipment list](#)

All equipment in the facility shall be listed. [The item number, name, quantity, applicable code, main dimensions, materials of construction, design temperature and pressure, etc. shall be included.](#)

3.6. [Equipment data sheets](#)

1) Vessels

Outline sketches for reactors, columns, vessels and tanks shall be prepared, including the following data:

- Diameter and height or length
- Number, type, and spacing of trays (for columns)
- Number and sizes of nozzles
- Maximum operating temperatures and pressures
- Design temperatures and pressures
- [Materials of construction](#) and corrosion allowances
- Liquid levels and/or interface levels and [all associated dimensions](#)
- Insulation requirements

Basic information including sketches with dimensions for internals such as draw-off pans, distributors, spray nozzles, packing, mist eliminators, etc

The specifications and process loadings for trays or packing shall be

 SAMSUNG ENGINEERING	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u> Page 5 of 13
DATE: <u>2013.07.09</u>		

presented for all fractionators, strippers, absorbers or other contacting equipment. Special performance requirements for other process equipment internals such as mist eliminators, coalescers, separators, etc., if any, shall be attached to the vessel sketch.

2) Other equipment

Data sheets shall be prepared for each equipment item for the equipment types listed below. The data sheets shall include necessary and sufficient information for detailed design, such as process requirements, capacities, type, nozzle information, design temperature and pressure, material, corrosion allowance, etc.

- Tubular heat exchangers
- Air cooled heat exchangers
- Plate and frame heat exchangers
- Fired heaters
- Rotary machinery and their drivers
- Miscellaneous equipment

3.7. Instrument process data

Instrument Process data shall be provided to prepare Instrument Data sheet by Instrument Engineer. Data sheets for all instruments in the unit and facilities shall be prepared by Instrument Engineer. The process data shall include necessary and sufficient information for detail design and purchasing, such as process operating data, minimum flow rate, normal flow rate, maximum flow rate, minimum pressure drop, normal pressure drop, maximum pressure drop, control action, preliminary sizes, materials, etc.

3.8. Conceptual Plot plan

The plot plan in the basic design shall be based on the preliminary equipment sizes. All major equipment and pipe racks shall be shown.

3.9. Piping and instrumentation diagrams (P&IDs)

These diagrams shall show all equipment and the necessary operating and

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u> Page 6 of 13
DATE: <u>2013.07.09</u>		

control systems, relief systems, instrumentation, valves, piping with size, class, and insulation, spare equipment, design notation, etc.

3.10. Utility summary & Utility Diagram

The normal, maximum, and minimum estimated utility requirements for each unit shall be tabulated. Such figures shall be consistent with each operating case. The services to be considered are electric power, steam (all pressure levels), condensate, boiler feed water, process water, raw water, cooling water, sea water, fuel gas, fuel oil, instrument and plant air, inert gas, etc. Special requirements such as nitrogen purging, plant air for regeneration and de-coking, etc. shall be shown.

3.11. Tie-in diagrams (if necessary)

This shall be prepared to clarify piping connection points between an existing plant and the new plant. This diagram shall be as detailed as the P&IDs.

3.12. Material Selection Diagram

These diagrams shall show all equipment and the necessary material and corrosion allowable.

Material selection basis should be developed for each major equipment and piping item during the basic design work. The basis should show the operating and design temperature and pressure, corrosive contaminants, contents of H₂S, H₂ and sulfur, corrosion rate, corrosion allowance, estimated life, selected base materials, etc. This, however, does not need to be included in the basic design package, since the final selected material and corrosion allowance shall be specified on the equipment data sheets.

3.13. Chemical requirements

Provide the following information for all of the chemicals used in the process:

- (1) Name or designation
- (2) Purity as received
- (3) Purity required in the process
- (4) Initial fill quantity

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u> Page 7 of 13
DATE: <u>2013.07.09</u>		

(5) Annual consumption

(6) Physical properties

3.14. Catalyst requirements

The following information for each catalyst, packing and solid absorbent or adsorbent employed in the process:

(1) Service

(2) Name or designation

(3) Acceptable suppliers

(4) Volume required

(5) Density

(6) Pellet or grain size and shape

(7) Design life

(8) Maximum bed height

(9) Regeneration requirements and frequency

3.15. Effluents data

All gaseous and liquid effluents shall be tabulated. Include the quantities and qualities of impurities which are the subject to control (sulfur compounds, phenol, oil, etc.). This information will facilitate determining the environmental impact of the project.

Estimates for the controlling loads for the flare/blowdown system(s) shall be included. Depending upon the Basic Design Package scope, preliminary estimates for each individual relief device may be provided (For certain projects the information will be developed during the detailed design phase and will not be included in the package). When provided, gas and liquid flow rates to be routed to the flare or blowdown system shall be tabulated for each failure and safety relief valve, along with normal flows (if any). The table shall contain: normal operating temperature and pressure, set pressure, allowable back-pressure, fluid name, relieving temperature at the safety valve inlet and outlet, flow rate, MW or density, CP/CV, compressibility factor, and disposal header identification.

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u>
DATE: <u>2013.07.09</u>		Page 8 of 13

3.16. Laboratory Manual

Detailed analytical procedures are prepared separately in the form of an Analytical Manual.

3.17. Standard Analytical Method

The analytical method comprises sample name, sampling point, analytical items, analytical methods and sampling frequency. This Method can be included in Operation manual.

For additional details on the Operation Manual, please refer to SPD0039ERN

3.18. Operating Guide & Manual

From the Contractor's standpoint, the purpose of an operation manual is not only to help the operation engineers on the customer side, but also to protect the Contractor from any liability which may arise as a result of any trouble or damage the plant sustains due to malfunction.

It is impossible to design a perfectly safe plant. Accordingly, the design philosophy mentioned in Design Philosophy (SPD0005ERN) should be reflected in the operation manual. Also, minor defects may be found during the design stage and should be covered by the pertinent operation manual, or preferably by modification of design.

In this context, it should be emphasized that the preparation of an operation manual is the final item of basic design work.

For additional details on the Operation Manual, please refer to SPD0039ERN.

3.19. General specifications and standard drawings

These specifications and drawings shall be attached to the basic design package. General specifications shall cover the basic and overall requirements for materials, design, fabrication, inspection and testing of each equipment item. Standard drawings shall be prepared for equipment, equipment parts, piping, fittings, instrumentation, etc., and shall have SECL numbers.

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: 2 Page 9 of 13
DATE: 2013.07.09		

3.19.1. Piping classifications

The table shall include for each piping class: class name, service flange rating and facing, minimum and maximum temperatures, basic materials, material of valve trims and corrosion allowances.

3.19.2. Insulation thickness table

Hot insulation thickness for heat conservation shall be tabulated per pipe size and fluid temperature. Base data to select insulation thickness shall also be included, such as ambient temperature, wind velocity, annual operating hours, annual interest, depreciation, thermal conductivity of insulation material, coefficient of heat transfer, and fuel cost. Insulation thickness for other purposes, such as personnel protection, cold insulation, dew protection and fire protection shall be tabulated separately on request.

3.19.3. Hazardous area classification

This shall indicate the sources of hazards and the extent of hazardous areas. Include the area classifications for the selection of electrical equipment.

4. ARRANGEMENT OF PACKAGE

Contents of the basic design package shall be arranged in sequence as shown on Table 4-1. It shall contain partition papers, with titles, inserted in-between each section.

 SAMSUNG ENGINEERING	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: 2 Page 10 of 13
DATE: 2013.07.09		

5. Tables and Figures

5.1. Table 4-1 Contents of Basic Design Package

1.0 BASIS OF DESIGN

1.1 Process Design Basis

1.2 Basic Engineering Design Data (BEDD Sheets)

2.0 PROCESS SPECIFICATIONS

2.1 Process Description

2.2 Process Flow Diagrams

3.0 UTILITIES AND EFFLUENTS

3.1 Utilities

3.2 Catalysts

3.3 Chemicals

3.4 Effluents

3.5 PSV and flare loads

4.0 EQUIPMENT

4.1 Equipment List

4.2 Vessels

4.3 Heat Exchangers

4.4 Fired Heaters

4.5 Rotary Machinery

4.6 Miscellaneous Equipment

5.0 INSTRUMENTS

[5.1 Instrument Process Data](#)

[5.2 Interlock Description](#)

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u> Page 11 of 13
DATE: <u>2013.07.09</u>		

[5.3 Instrument Data Sheet \(by Instrument Engineer, if required\)](#)

6.0 PIPING

6.1 Piping Classification [\(by Piping Engineer, if required\)](#)

6.2 Insulation Thickness Table [\(by Piping Engineer, if required\)](#)

7.0 DRAWINGS

[7.1 Process Flow Diagrams \(with Heat and Material Balance\)](#)

7.2 Piping and Instrument Diagrams

7.3 Utility Diagrams

7.4 Tie-in Diagrams (if necessary)

7.5 [Conceptual](#) Plot Plan

7.6 [Material Selection Diagrams](#)

7.7 Hazardous Area Classification [\(by Electric Engineer, if required\)](#)

8.0 GENERAL SPECIFICATIONS AND STANDARD DRAWINGS (if necessary)

[9.0 OPERATION GUIDE](#)

[9.1 Operation Guide](#)

[9.2 Operation Manual](#)

[9.3 Laboratory Manual](#)

[9.4 Standard Analytical Method](#)

	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: 2
DATE: 2013.07.09		Page 12 of 13

5.2. Figure 2-1. Typical Arrangement of Titles

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	PROCESS DESIGN MANUAL BASIC DESIGN PACKAGE	SPD0007ERN REV.: <u>2</u> Page 13 of 13
DATE: <u>2013.07.09</u>		

6. REVISION HISTORY

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1	2010.11.20	All Pages	Document Numbering Revision -Team: Process Engineering -Prepared by: Y.S.Seo -Checked by: Henry Sung, J.C.Noh, H.H. Kwak, M.H.Oh, S.E.Hong -Approved by: E.D.Lee
<u>2</u>	<u>2013.07.09</u>	<u>All Pages</u>	<u>Partial Revision</u> <u>-Team: Process Engineering Department</u> <u>-Prepared by: I.Hwang</u> <u>-Checked by: P.M.Hur, M.H. Oh</u> <u>-Approved by: S.B.Lee</u>