

PROCEDURE MANUAL

SPD0001ERN-USA

PROCESS DESIGN MANUAL

**PROCESS TEAM WORK FLOW SHEET REGARDING
LICENSED JOB**

REV.: 2

DATE: 08 June 2011



**SAMSUNG
ENGINEERING**

SAMSUNG ENGINEERING AMERICA INC

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1. GENERAL

1.1. PURPOSE

Its purpose is to clarify the work contents of process team and other teams regarding each stage of Job and to educate Process Manager regarding the meaning and importance of the work.

1.2. USE ATTENTION

This work flow sheet is mainly focused on the works of process team, so most of the work, which is not directly related to that of process team is not included here, such as identification of Job Flow before the contract and local work & commissioning or procurement, inspection & test during the Job. Therefore, for its details, see the related manuals and data stated in Section 1.3.

1.3. RELATED MANUAL AND WORK

P & ID AND ISSUE OF UTILITY FLOW DIAGRAM

DATA PREPARATION FOR KICK-OFF MEETING & LAUNCHING
MEETING OF EACH TEAM

WORK FLOW SHEET OF PROJECT ENGINEER

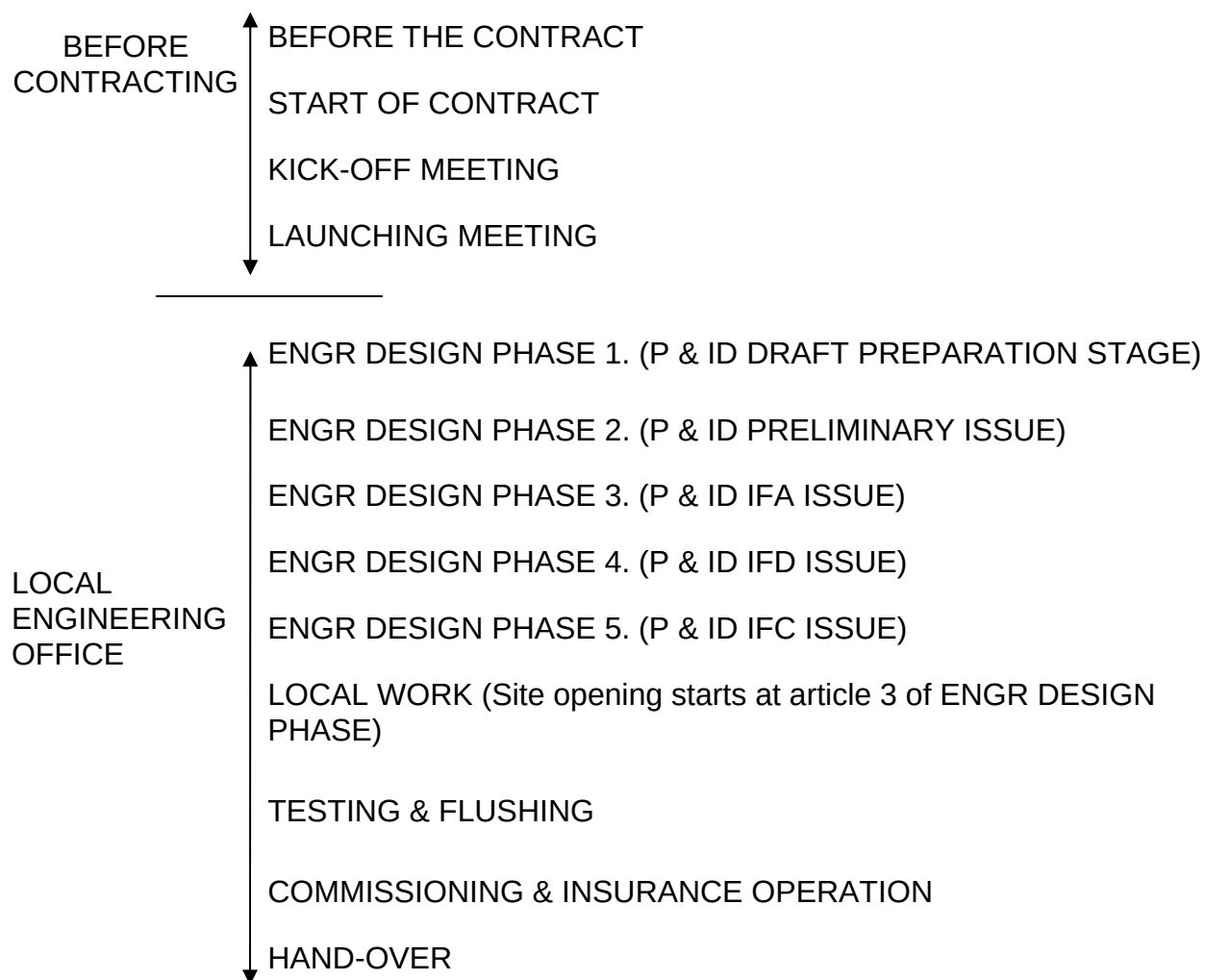
CONSTRUCTION PLANNING

APPROVAL STANDARD OF PROCESS TEAM

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2. WORK FLOW SHEET

Job Progress can be divided into several phases in accordance mainly with each Issue of P & ID.



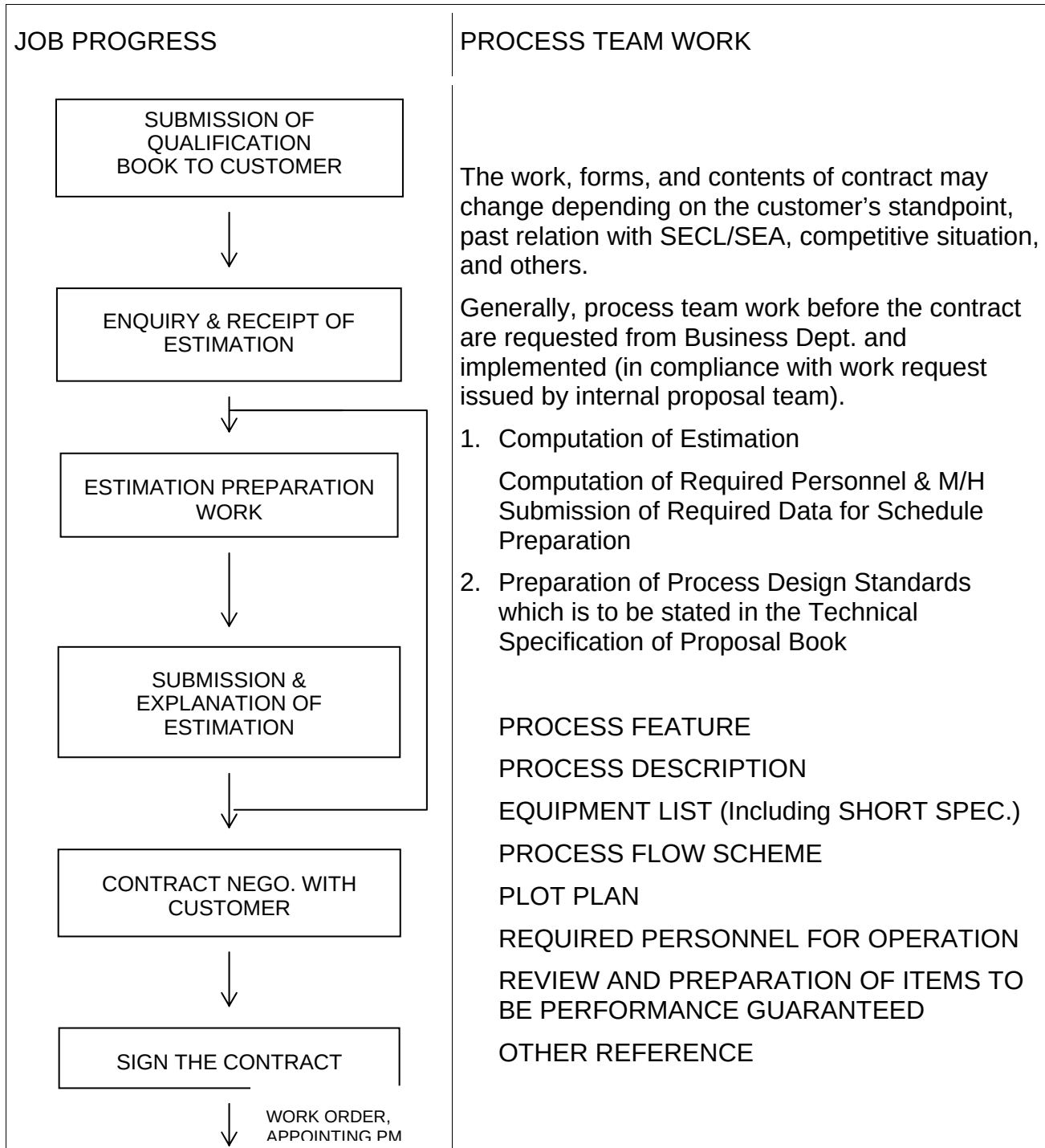
3. LOCATION OF MAIN WORK REGARDING GENERAL JOB FLOW

Among the various task, main tasks from the contract to the hand-over of the unit as they are listed in the overall schedule, process team's work, and other related works are implemented in the early stage of general job Work Flow.

Since the Job is based on the work contents of process team, its interim change of work may result in not only the disorder of overall flow but also delaying the work progress.

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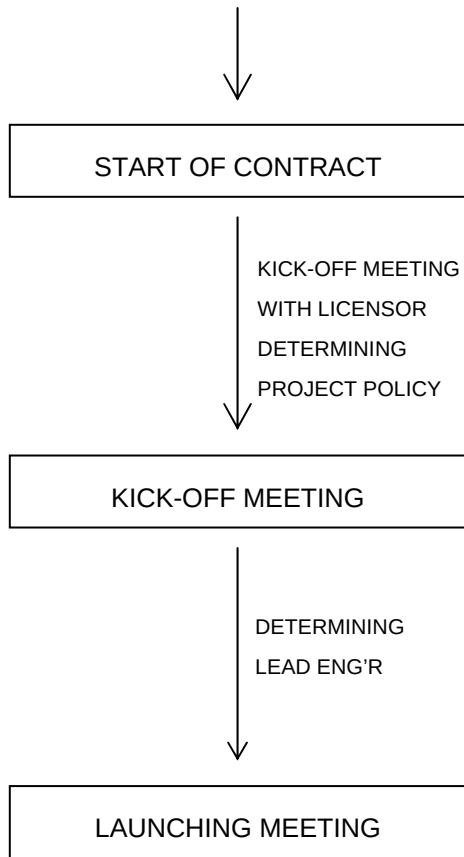
Implement the task quickly and accurately by fully recognizing these points.



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JOB PROGRESS

(Continued from next page)



PROCESS TEAM WORK

Requirements of SECL/SEA shall be understood by the Licensor for the preparation of Design Basis, Design Philosophy, Design Condition, Scope of Work, Work Schedule, and implementation of work for obtaining the cooperation of Licensor.

(Attendance of Team Manager)

1. Project Manager shall explain the contract format, price, installation scope, project schedule, and other important policies and receive enquiries.
2. Notification of Lead Engineer of the Project (With presence of Lead Engineer, most of the work can be conducted by L/E)
 - a) Acquiring data including Job Instruction, Project Schedule, Account Code, Survey Report, Basic Design Condition, and Other Project Memos.
 - b) Lead Engineer shall be given the Work Policies and directions from Team Manager.

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
ENGINEERING DESIGN PHASE 1 (PDP PREPARATION)		
REVIEW OF CONTRACT (EACH TEAM) FOLLOW-UP ON LAUNCHING DATA (PROJECT TEAM) PLOT PLAN DESIGN (PROCESS, PIPING, PROJECT TEAM) EQUIPMENT LIST (IFD) PREP. (PROCESS, PROJECT TEAM) STANDARD ENGINEERING SPEC. PREPARATION EXECUTION BUDGET PREPARATION (PROJECT TEAM) PRESENTATION OF EXECUTION MAN-HOURS (EACH TEAM)	1. REVIEW CONTENTS OF CONTRACT AND CHECK THE ISSUE POINTS 2. PROCESS DESIGN STANDARDS PREPARATION 3. MATERIAL & HEAT BALANCE (CALCULATION & TABLE PREP.) 4. UTILITY BALANCE (CALCULATION & TABLE PREPARATION) 5. PRESSURE BALANCE (CALCULATION) 6. ESTIMATION OF MATERIALS 7. PROCESS FLOW DIAGRAMS PREPARATION (PRELIMINARY)	1. PROJECT TEAM DETERMINES AVAILABLE STATUTORY, REGULATORY REQUIREMENTS. 2. EACH DESIGN TEAM USES AS ATTACHMENT TO PURCHASE SPECIFICATION FOR REGISTERING ESTIMATION. 4. IN CASE OF COMPLEXITY, IT IS USED AS DESIGN BASIS OF COMMON UTILITY FACILITY.
ENGINEERING DESIGN PHASE 1 (ALTERNATIVE)		
(ANNOTATION 1)		

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
ACCEPTANCE OF LICENSOR PACKAGE	(ALTERNATIVE CASE) IN CASE OF LICENSED PROCESS, SINCE LICENSOR IMPLEMENTS BASIC DESIGN, PROCESS TEAM SHALL REVIEW THE WORK ITEMS OF ARTICLE NUMBER 3 TO 9, AND WHERE REQUIRED, ADD JOB SPECIFICATIONS AND REQUIRED DATA FOR DETAILED ENGR. LICENSOR SCOPE IS LIMITED TO PROVIDING THE PROCESS DESIGN PACKAGE; THEREFORE, PROCESS TEAM SHALL PROVIDE THE UTILITY PACKAGE. LICENSOR PACKAGE GENERALLY INCLUDES THE FOLLOWING: (LICENSOR PACKAGE CONTENTS MAY DIFFER DEPENDING ON THE LICENSOR CONTRACT)	THERE ARE TWO CASES REGARDING THE RELATION BETWEEN SECL/SEA AND LICENSOR IN CASE OF LICENSED PROCESS 1. THE CASE WHERE LICENSOR AND THE CUSTOMER CONCLUDE LICENSOR CONTRACT THEN THE BASIC DESIGN PACKAGE IS GIVEN TO SECL/SEA BY THE CUSTOMER. 2. MORE COMMON CASE IS IN WHICH SECL/SEA CONCLUDES CONTRACT WITH LICENSOR, BASIC DESIGN PACKAGE IS DIRECTLY GIVEN TO SECL/SEA, AND SECL/SEA PRESENTS THE BASIC DESIGN PACKAGE PROVIDED BY LICENSOR TO THE CUSTOMER AS A TECHNICAL DATA BOOK AFTER THE COMPLETION OF PLANT DESIGN.

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
	1. PROJECT SPECIFICATIONS (DEFINES TERMS OF DESIGN, INSURED ITEMS) 2. EQUIPMENT LIST 3. PROCESS FLOW DIAGRAMS 4. MATERIAL BALANCE 5. UTILITY BALANCE 6. P & I DIAGRAMS 7. PROCESS SKETCHES 8. EQUIPMENT DATA SHEETS	1. PRELIMINARY DISCUSSION MAY BE REQUIRED IN ORDER TO USE SECL/SEA FORMS REGARDING THE LICENSOR PACKAGE PREPARATION IN CASE OF A DOMESTIC LICENSOR 2. SAME ATTENTION SHALL BE CONSIDERED AS THE ITEM 1, IN CASE OF PLACING AN ORDER TO THE VENDOR AS A PACKAGE. 3. DEPENDING ON THE EXPERIENCE OF THE LICENSOR, DATA FROM LICENSOR MAY VARY AND FURTHER REVIEW OF THE PROCESS DESIGN PACKAGE MAY BE REQUIRED. THE DATA SHALL BE CONFIRMED WHETHER IT IS SUFFICIENT TO PROGRESS THE SECL/SEA ENGR. IF NEEDED, SECL/SEA WILL PROVIDE THE FORMATS TO THE LICENSOR IN ORDER TO FILL OUT THE DATA IN THE SECL/SEA FORMS. GENERALLY LICENSOR IS REQUIRED TO PROVIDE ANY INCOMPLETE LICENSED DESIGN DATA , WHILE SECL/SEA IS RESPONSIBLE FOR SCHEDULING AND COST.

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
	9. INSTRUMENT DATA SHEETS 10. OPERATING INSTRUCTIONS 11. ANALYTICAL MANUAL 12. INFORMATION ON CATALYST & CHEMICALS ETC. 13. SEQUENCE & INTERLOCK FLOW DIAGRAMS 14. PIPING SPECIFICATIONS 15. EFFLUENT SUMMARY WITH SOURCE 16. INFORMATION ON HAZARDOUS MATERIALS	
	ENGINEERING DESIGN PHASE 2 (BASIC ENG'S/ DETAIL ENGR)	
DETERMINING PROCUREMENT PHILOSOPHY (PROJECT TEAM)	1. PREPARATION OF P & I DIAGRAM (PRELIMINARY)	1. BASIC DRAWING FOR OTHER TEAMS WORK, ESPECIALLY PIPING TEAM. USE IT FOR PIPING PLAN, INSTRUMENT ARRANGEMENTS, ETC

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
SELECTION OF REVIEW FORM REGARDING PROCESS DATA & PREPARATION OF PURCHASE SPEC. (EACH TEAM) PREPARATION OF STANDARD ENGR SPEC.	2. UTILITY FLOW DIAGRAM PREPARATION (PRELIMINARY) 3. PROCESS DATA FOR PIPING MATERIAL PREPARATION (IFA)	2. DRAFT PREPARATION OF UDD *BY PIPING TEAM 3. H-103 ¹ PREPARATION BY PIPING TEAM/ DETERMINED PIPING SPEC. IS USED FOR THE PREPARATION OF P&ID
START PIPING COURSE DESIGN (PIPING TEAM) START ELECTRICAL EQUIP. & INSTRUMENT DESIGN (ELECTRICITY CONTROL TEAM) START PREPARATION OF SCHEDULE FOR CONSTRUCTION (CONSTRUCTION TEAM)	4. EQUIPMENT PROCESS DATA SHEET PREPARATION a) VESSEL PROCESS DATA SHEETS b) PUMP & COMPRESSOR PROCESS DATA SHEETS c) HEAT EXCHANGER PROCESS DATA SHEETS d) OTHER SPECIAL EQUIPMENT PROCESS DATA SHEETS (INCLUDING TRAY DATA)	4. a) PREPARATION OF ENGR DWGS (MACHINERY TEAM) b) PREPARATION OF EQUIPMENT DATA SHEETS (MACHINERY TEAM) c) PREPARATION OF ENGR DWGS (MACHINERY TEAM) d) PREP. OF EQUIPMENT DATA SHEETS (MACHINERY TEAM)

* This appears to be UFD, Utility Flow Diagram.

¹ This needs to be defined or clarified later.

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
	5. PREPARATION OF INFORMATION & PROCESS REQUIREMENTS REGARDING PLOT PLAN 6. EQUIP. LIST ORIGINAL PREP. 7. DETERMINING FLUID CODES 8. NPSH AVAIL. CALCULATIONS 9. INSTRUMENT PROCESS DATA (IFA) & SEQUENCE & INTERLOCK DESCRIPTION PREPARATION	5. ORIGINAL DOCUMENT IS PREPARED BY PIPING TEAM BASED ON THIS FORM THROUGH GENERAL REVIEWING OF ITS ECONOMIC MATTERS, OPERATION & REVAMP, SAFETY, AVAILABLE REGULATIONS AND RULES 6. EQUIP. LIST PREPARATION BY PROJECT TEAM BY REVIEWING ORDERING FORM AND OWNERSHIP SCOPE OF VENDOR 9. INSTRUMENT SCHEDULE, SEQUENCE INTERLOCK DRAWING PREPARATION BY ELECTRICAL & INSTRUMENT ENGR TEAM
	10. PREP. OF BASIC DESIGN DATA, INFORMATION, & POLICIES a) BASIC SAFETY CONSIDERATIONS b) BASIC DATA OF FIRE EXTINGUISHING FACILITIES c) BASIC DATA FOR DETERMINING EXPLOSION PROOF ZONES d) BASIC DATA FOR REMOVAL OF STATIC ELECTRICITY	10. a) SAFETY CONSIDERATION BY EACH TEAM b) SENDING VARIOUS DATA OF INFLAMMABLE FLUIDS TO PIPING ENGR TEAM c) SENDING DATA REGARDING SOURCES OF EXPLOSIVE MATERIALS TO ELECTRICAL CONTROL

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
	e) COUNTERMEASURE AGAINST FROST OR CONSOLIDATION f) COUNTERMEASURE AGAINST HIGH HUMIDITY AREA g) COUNTERMEASURE AGAINST COLD AREA h) COUNTERMEASURE AGAINST SERVICE INTERRUPTION & EMERGENCY POWER CONSIDERATION i) INFO. ON STORAGE & LABORATORY	e) DETERMINATION WITH THE COOPERATION OF PROJECT TEAM h) SENDING DATA TO ELECTRICAL & INSTRUMENT ENGR TEAM AND APPLYING DATA TO THE SINGLE LINE DIAG. (SENDING THE EMERGENCY POWER REQUIREMENT) i) SENDING DATA TO PROJECT TEAM REGARDING THE ARRANGEMENT OF REQUIRED AREA
	j) DATA OF CATALYSTS AND CHEMICALS k) BASIC CONSIDERATION OF SEWAGE & EXHAUST GAS l) ELECTRICAL, CONTROL OPERATION REQUIREMENTS m) COUNTERMEASURE AGAINST VIBRATION & NOISE	j) ARRANGEMENT OF DATA AND SENDING TO PROJECT MANAGEMENT TEAM. MACHINERY TEAM IS ALSO INVOLVED. k) RELATED TO PIPING AND CIVIL & ARCHITECTURAL ENGR TEAM REGARDING MAINLY SEWER PLAN, PIT PLAN, ETC l) APPLIED TO PANEL PLAN (ARRANGEMENT & LAMP INDICATION ON PANEL).

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
	n) INFO. FOR SPARE PHILOSOPHY AND MAINTENANCE REQUIREMENTS 11. DISCHARGE PLAN FOR SAFETY VALVES, RUPTURED DISKS, ETC 12. REVIEW OF PLOT PLAN	
ENGINEERING DESIGN PHASE 3 (Detail Engineering)		
TRANSPORTATION PLAN (PROJ.TEAM, PROCUREMENT TEAM)	1. PROCESS FLOW DIAG. (IFD) ISSUE	
PROCUREMENT SPECIFICATION PREP. (PIPING, MECHANICAL ENGR TEAM) PRICE NEGO., ORDERING (PROJECT, PURCHASING TEAM) LOADING DATA PREPARATION (EACH DESIGN TEAM) START OF ELECTRICAL, INSTRUMENTATION & CONTROLS DETAILED DESIGN (ELECTRICAL, INSTRUMENTATION & CONTROLS TEAM) START OF PAVING, STRUCTURE & SUPPORT PLAN (ENGR TEAM)	2. UTILITY BALANCE DIAG. (IFD) ISSUE 3. P & I DIAG. (IFA) ISSUE 4. UTILITY FLOW DIAG.(IFA) ISSUE SHALL BE IMPLEMENTED AFTER COLLECTING SPECIFIC INFORMATION FROM EACH TEAM. P&ID & UFD ISSUES REQUIRE DETAILED EXPLANATIONS AND CUSTOMER APPROVAL BY CONTRACT. CUSTOMER COMMENTS SHALL BE APPLIED TO IFA.	3. EACH DESIGN TEAM COMPLETES THE DETAILED DESIGN WITH IT. PIPING TEAM SHALL TAKE-OFF PRELIMINARY B/M.

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
START CONSTRUCTION PLAN (CONST. TEAM)	5. PROCESS DATA FOR PIPING MATERIAL (IFA) ISSUE 6. INSTRUMENT PROCESS DATA (IFD) ISSUE 7. FILL IN THE PROCESS DATA ON THE PIPING SPECIALTY SCHEDULE 8. REVIEW & CHECK VENDOR'S COPIES (SPEC. SHEETS, P & I DIAG'S, ETC)	5. PIPING TEAM COMPLETES H-103 6. PREPARATION OF INSTRUMENT SCHEDULE (IFD) BY CONTROL TEAM. IMPLEMENTATION OF DETAIL DESIGN WITH THE INCLUSION OF SEQUENCE & INTERLOCK DWG. AND PANEL ARRANGEMENT. 7. PIPING TEAM SHALL PREPARE PURCHASE SPECIFICATION.
	9. REVIEW & CHECK THE DATA OF EACH TEAM (INSTRUMENTATION SCHEDULE, SEQUENCE & INTERLOCK FLOW DIAG'S, ENGR DWG'S. SAFETY PLANS, OTHER INSTRUMENTATION SPECS, ETC.) 10. NPSH AVAILABLE RECONFIRMATION 11. REBOILER CIRCUIT RECONFIRMATION 12. UTILITY CONSUMPTION CHECK (INCLUDING VENDOR INFORMATION)	10. THERE MAY BE A CASE WHERE A CHANGE IS NEEDED REGARDING PIPELINE PATHS AND FOUNDATION HEIGHTS OF EQUIPMENTS. 11. EQUIVALENT
ENGINEERING DESIGN PHASE 4 DETAIL ENGINEERING		

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
EQUIPMENT LIST (IFC) PREP. (PROJECT TEAM) DETAILED DRAWING COMPLETION (IFD) OF EACH TEAM	1. P & I DIAG'S (IFD) ISSUE 2. UTILITY FLOW DIAG'S (IFD) ISSUE	1. PIPING TEAM SHALL USE IT FOR PREPARATION OF PIPING DWG'S & ARRANGEMENT OF PIPING MATERIALS. 2. EQUIVALENT
PURCHASE SPECIFICATIONS OF ELECTRICAL & CONTROLS ELEMENTS AND PIPING MATERIALS (PROJECT, PURCHASING, CONTROLS, & PIPING TEAM)	3. STATING PROCESS DATA ON LINE SCHEDULE (IFA)	3. PIPING TEAM SHALL USE IT FOR THERMAL STRESS CALCULATIONS OF PIPELINE, PREPARING LOADING DATA (IFD), HOT & COLD CONSERVATION, AND DATA ARRANGEMENT. CONSTRUCTION TEAM SHALL USE THIS FOR FLUSHING PLAN.
EXPEDITING (PROJECT, PURCHASING TEAM) TEST & FLUSHING PLAN, TRANSPORTATION PLAN, ETC. (CONSTRUCTION TEAM)	4. REVIEW & CHECKING OF VENDOR'S DATA (PRINT) 5. REVIEW OF PIPING DRAWINGS (PROCESS SPECIAL REQUIREMENT) 6. REVIEW OF SEWAGE PLAN 7. OPERATING INSTRUCTIONS PREPARATION 8. PREPARATION OF BASIC DATA FOR THE ANALYSIS MANUAL	7. COMMISSIONING TEAM SHALL PREPARE STANDARD OPERATION PROCEDURE (S.O.P.) REFERING TO THE OPERATION GUIDELINE FROM VENDOR AND P&I DIAG. 8. COMPLETED BY PROJECT TEAM.
ENGINEERING DESIGN PHASE 5 (FOLLOW-UP)		

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JOB PROGRESS	PROCESS TEAM WORK	RELATION TO OTHER TEAMS WORK
IFC ISSUE OF EACH TEAM'S DRAWINGS AND DATA	1. PROCESS FLOW DIAG. (IFC) ISSUE	1.5. EACH TEAM CONDUCTS FINAL CHECK WITH THESE DATA. IFC ISSUE OF DRAWINGS AND DATA WHICH ARE PUBLISHED BY EACH TEAM SHALL BE IMPLEMENTED.
	2. UTILITY BALANCE DIAG. (IFC) ISSUE	
	3. P & I DIAG'S (IFC) ISSUE	
	4. UTILITY FLOW DIAG. (IFC) ISSUE	
	5. MAKING UP THE LINE SCHEDULE (IFD)	5.COMPLETED BY PIPING TEAM FOR IFC USE.
	6. PREPARATION OF BASIC DATA FOR INSURED OPERATION MANUAL	6. COMPLETED BY THE TEAM WHICH IS IN CHARGE OF THE OPERATION.
	7. FOLLOW-UP IN CASE OF PROBLEMS FOUND FROM VENDOR OR AT LOCAL SITE	7. EACH RELATED TEAM SHALL CONDUCT REVISION(S) OF DRAWINGS, ORDERS OF ADDITIONAL ITEMS/EQUIPMENT REQUIRED, AND DESIGN CALCULATION CHECKS. OTHER PARTICULAR WORK MAY BE REQUIRED WITH THE REVISED DATA FROM THE PROCESS ENGR TEAM.
	8. SUBMISSION OF JOB CLOSE OUT REPORT	

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JOB PROGRESS	PROCESS TEAM WORK
SITE REFERENCE IMPLEMENTED IN PHASE 3 OF ENGR DESIGN SITE CONSTRUCTION TEST & FLUSHING COMMISIONING	Each team shall conduct Follow-up in case of local problems while executing the following works (see PHASE 5.7 of previous articles) WORK OF CONSTRUCTION TEAM The team shall negotiate with vendor and Customer or direct works in regard to local site survey, grading, storage and assembly of construction materials, foundation work, paving work, structural engineering work, equipment installation and construction, land & underground piping work, heat insulation work, controls work, electrical work, foreign materials control (acceptance, contents inspection, confirmation on quantity, confinement, etc). WORK OF CONSTRUCTION TEAM After the completion of work on equipment installation and construction of piping, the piping system including equipment shall be leak-tested at proper (internal) pressure levels and, cleaned, (use of water, steam, air or chemicals) and then dried if required. Idling of Rotating Machines, Dry-out and Blow out, loading of catalyst, initial charge of chemical, etc. WORK OF COMMISSIONING TEAM After Piping team conducts Line Check, piping pressure test will be performed using air or water. After determining that no problems are detected, normal operation of equipment shall be implemented. It is general practice to check each item carefully and then raise the stress stage by stage to the final stress. Depending on the contract, SECL/SEA may dispatch a supervisor, and an operator of the Customer will implement the operation of plant.
INSURED OPERATION (GUARANTEED	COMMISSIONING TEAM

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PERFORMANCE)	Confirm the guarantee figures in the presence of Customer after continuing the plant operation for a fixed period: conduct the Operation in order to prove the performance of the equipment. (Depending on the contract, SECL/SEA may dispatch only a supervisor, and Customer may conduct the operation. In this case, Process team shall cooperate in collecting Operation data regarding Capacity assurance)
HANDOVER	BUSINESS TEAM Equipment shall be completely handed over to the Customer if its design capacity has been proven at the commissioning. In this matter, Workmanship guarantee is left regarding the payment method to SECL/SEA.² (ANNOTATION) Depending on the type of contract, various forms of hand-over to the Customer are implemented. These hand-over's can be initiated after the completion of Test & Flushing (Mechanical Completion). In this case, later operations (including one for assurance) and maintenance repairs shall be conducted by the Customer in the presence of SECL/SEA.

² This statement seems unclear and needs to be clarified.

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4. ENGINEERING DESIGN PHASING AND WORK ITEM

ENGR STAGE	P & ID ISSUE STAGE	PROJECT	PROCESS	MECHANICAL	
				TOWER/TANK & H/EX	FURNACE & HEATER
PHASE 1 BASIC STUDY	BASIC STUDY	1) CONTRACT, SITE SURVEY REPORT 2) APPLICABLE STAND. CODES & RULES 3) JOB INSTRUCTIIONS 4) DESIGN INFORMATION 5) PLOT PLAN 6) EQUIPMENT LIST (IFD) 7) COORDINATION PROCEDURE	1) PROCESS FLOW DIAG. (PRE) 2) MAT. BALANCE (IFA) (PROCESS DUTY) 3) MAT. BALANCE (IFA) (UTILITY DUTY) 4) PROCESS SKETCH (IFD) 5) DATA SHEET (IFD) 6) B.L CONDITION	1) CONTRACT STUDY 2) ST'D ENGR SPEC'S	1) CONTRACT STUDY 2) ST'D ENGR SPEC'S.
PHASE 2 BASIC ENGR	P & ID FOR IFR	1) PROCURMENT POLICY JOINT VENTURE REVIEW B.L SELECTION FOR EQUIP. ORDER DECISION OF SITE PROC. PREFABRICATION ITEMIZED	1) P & ID (PRE) 2) UTILITY FLOW DIAG. (PRE) 3) PROCESS DATA FOR PIPING MATERIAL (IFA) 4) INSTR. PROCESS DATA (IFA) 5) PLANT DESIGN PHILOSOPHY 6) ROTATING MACHINE PERFORM. CALCULATIONS	1) PROCESS SKETCH (IFD) DATA SHEET (IFD) 2) H/EX. RATING	1) PROCESS SKETCHES AND DATA STEETS (IFD) 2) PERFORMANCE CALCULATIONS 3) REQUISITIONS
PHASE 3 DETAIL ENGR	P & ID FOR " IFA" FROM IFR	1) TRANSPORTATION SCH.	1) PROCESS FLOW DIAG'S IFD) 2) MAT. BALANCE (IFD) 3) PROCESS DATA FOR PIPING MAT. (IFD) 4) P & I DIAG. (IFA) 6) UNDER GROUND P & ID (IFD) 7) INSTR. PROCESS DATA (IFD) 8) PACKAGE UNIT VENDOR P & ID REVIEW (PRE)	1) STRENGTH CALCULATIONS (IFA) 2) ENGR DWG'S (IFA) (FOR INQUIRY) 3) REQUISITIONS 4) VESSEL ST'D (IFD)	1) ASSEMBLY DWG'S CHECK (IFD) 2) TIE-IN POINTS CHECK 3) FOUNDATION INFORMATION (IFD)

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ENGR STAGE	P & ID ISSUE STAGE	PROJECT	PROCESS	MECHANICAL	
				TOWER/TANK & H/EX	FURNACE & HEATER
PHASE 4 DETAIL ENGR	P & ID FOR "IFD" FROM " IFA" U/G P & ID "IFC"	1) EQUIPMENT LIST (IFC)	1) P & I DIAG. (IFD) 2) UTILITY FLOW DIAG. (IFD) 3) U/G P & I DIAG. (IFC) 4) PACKAGE UNIT VENDOR P & ID REVIEW	1) ENGR DWG'S (IFD) 2) VENDORS PRINT CHECK (IFC)	1) ASSEMBLY DWG'S CHECK (IFC) 2) LOADING DATA (IFC) 3) VENDOR P & ID CHECK (IFC)
PHASE 5 FOLLOW- UP	P & ID FOR "IFC" FROM "IFD"		1) P & ID DIAG. (IFD) 2) UTILITY FLOW DIAG. (IFC) 3) PROCESS FLOW DIAG. (IFC) 4) UTILITY BALANCE DIAG. (IFC) 5) OPERATING INSTRUCTIONS	1) ENGR DWG'S (IFC) 2) VENDOR'S PRINT CHECK (IFC) 3) PLATFORM & ATTACHMENT DWG'S (IFC)	1) PLATFORM & ATTACHEMENT DWG. (IFC) 2) VENDOR'S PRINT CHECK (IFC) 3) ERECTION & MAINTENANCE INFORMATION
PHASE 6	P & ID IFC		1) P & I UTILITY FLOW DIAG. FOLLOW UP	1) FOLLOW UP	1) FOLLOW UP

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MECHANICAL			
PUMP/COMPRESOR & PACKAGE UNIT	INSTRUMENT	ELECTRIC	PLANNING & PIPING
1) CONTRACT STUDY 2) ST'D ENGR SPEC'S	1) CONTRACT STUDY 2) ST'D ENGR SPEC'S 3) FOR VENDOR ENGR SPEC'S	1) CONTRACT STUDY 2) ST'D ENGR SPEC'S	1) CONTRACT STUDY 2) PLOT PLAN (PRE) 3) B/L CODITIONS
1) PROCESS DATA SHEET (IFD) STUDY 2) REQUISITION	1) CONTROL ROOM LAYOUT (PRE) 2) LOCAL PANEL & ANALYZER LAYOUT (PRE) 3) MAIN CABLE DUCT ROUTING (PRE) 4) P & ID CHECK	1) HAZAROUS AREAS PLAN (PRE) 2) ELECTRIC EQUIP. ARRANGEMENT (PRE) 3) MOTOR SCHEDULE (PRE) 4) SINGLE LINE DIAG. (PRE)	1) ENGR SPEC (PRE)
1) VENDOR'S P & ID CHECK (IFD) 2) ASSEMBLY DWG'S CHECK (PRE) 3) LOADING DATA (IFD)	1) CONTROL ROOM LAYOUT (IFA) 2) MAIN CABLE DUCT ROUTING (IFA) 3) LOCAL PANEL & ANALYZER LAYOUT (IFA) 4) CONTROL ROOM HEAT DUTY 5) INSTRUMENT UTILITY CALCULATIONS 6) INSTR. UTILITY SPEC'S 7) INSTR. SCHEDULE (PRE) 8) PANEL INST. ARRANGEMENT (PRE) 9) INTERLOCK DIAG. (PRE) 10) VESSEL NOZZLE CHECK 11) CONNECTION LIST	1) LOADING DATA (PRE) 2) UTILITY INFORMATION (PRE) 3) POWER STATION BASIC DESIGN 4) INTERLOCK DIAG. (PRE) 5) COMMUNICATION SYSTEMS BASIC DESIGN (IFA) 6) FIRE ALARM SYSTEMS BASIC DESIGN (IFA)	1) ROUTING STUDY 2) U/G PIPING DWG. (PRE) 3) U/G PIPING B/M (PRE) 4) MAJOR STRUCTURE RACK INFORMATION (IFD) 5) LINE SCHEDULE (PRE) 6) HYDRANT LAYOUT

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MECHANICAL			
PUMP/COMPRESSOR & PACKAGE UNIT	INSTRUMENT	ELECTRIC	PLAN & PIPING
1) ASSEMBLY DWG. CHECK (IFD) 2) VENDOR'S P & I CHECK (IFC) 3) LOADING DATA (IFC)	1) INSTR. SCH (IFD) 2) INTERLOCK DIAG. (IFD) 3) PANEL INST. ARRANGEMENT (IFD) 4) SEMI GRAPHIC SKETCH 5) LOCAL PANEL ARRANGEMENT (IFD) 6) REQUISITIONS (INSTRUMENT) 7) VENDOR'S PRINT CHECK 8) CABLE DUCT LAYOUT (IFD) 9) INST. PIPING & LOOP HOOK UP DWG'S (IFD) 10) LAYOUT OF CONTROL ROOM & ANALYZER SCHEDULE 11) INSERT INFORMATION 12) WIRING, TUBING, UTILITY PIPING LAYOUT (IFA)	1) SINGLE LINE DIAG. (IFD) 2) ELECT. EQUIP. ARRANGEMENT (IFD) 3) HAZARDOUS AREAS PLAN (IFD) 4) MOTOR SCHEDULE 5) CABLE ROUTE PLAN (IFD) 6) LOADING DATA (IFD) 7) UTILITY INFORMATION (IFD) 8) ELEC. FACILITY DETAIL DESIGN 9) INTERLOCK DIAG. (IFD) 10) ENGR SPEC. FOR ELECT. EQUIP.	1) PIPING STUDY 2) FLEXIBILITY ANALYSIS 3) NOZZLE ORIENTATION 4) ENTERING & LEAVING AT B/L (IFC) 5) B/M REQUISITION (PRE) 6) INSERT PLATE INFORM (IFD) 7) PLOT PLAN (IFC) 8) SCALE MODEL 9) LINE SCHEDULE
1) ASSEMBLY DWG. CHECK (IFC) 2) AUXILIARY EQUIP. (IFC)	1) INSTR. SCH (IFC) 2) INTERLOCK DIAG. (IFC) 3) PANEL INSTR. ARRANGEMENT (IFC) 4) INSTR. PIPING & LOOP HOOK UP DWG'S (IFC) 5) WIRING TUBING UTILITY PIPING LAYOUT (IFC) 6) B/M 7) REQUISITION (BULK) 8) CABLE DUCT LAYOUT (IFC) 9) CABLE SCHEDULE	1) LIGHTING LAYOUT (IFC) 2) WIRING LAYOUT (IFC) 3) EARTH LAYOUT (IFC) 4) COMMUNICATION SYSTEM LAYOUT (IFC) 5) FIRE ALARM SYSTEM LAYOUT (IFC) 6) CABLE RACK ASSEMBLY (IFC) 7) CONSTRUCTION DWG'S (IFC) 8) CONNECTION DIAG. (IFC) 9) CABLE SCH. (IFC) 10) B/M 11) REQUISITION	1) PIPING DWG'S (IFC) 2) HANGING DWG'S (IFC) 3) B/M & REQUISITION (IFC) 4) LOCAL SUPPORT FOUND. INFORMATION (IFC) 5) LINE SCH. (IFD)
1) FOLLOW UP	1) FOLLOW UP 2) INSTR. SPARE PARTS LIST	1) FOLLOW UP	1) FOLLOW UP 2) LINE SCH. (IFC) 3) SPARE PARTS LIST

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CIVIL/ ARCHITECTURE	CONSTRUCTION	PROCUREMENT
1) CONTRACT STUDY 2) FOUNDATION HEIGHT ST'D (IFC) 3) GRADE LEVELING FIX (IFC)	1) CONTRACT STUDY 2) ENGR SPEC'S 3) CONSTRUCTION SPEC'S	
1) ENGR SPEC'S	1) MASTER CONSTRUCTION SCHEDULE (PRE) 2) STORE & PRE-FAB. AREA PLANNING (PRE) 3) CONSTR. EQUIP & MAT'L SCH 4) TEM. UTILITY & BUILD'G PLANNING (PRE) 5) CONST. SUB-CON. SELECTION	1) VENDOR RECOMMENDED 2) INQUIRY
1) PHOTOGRAPHIC SURVEY 2) SOIL EXPLORATION 3) STORM. OILY & CHEM. SEWER TRENCH INFORMATION 4) PAVING PLANNING (IFA) 5) MAJOR STRUCTURE RACK, BUILDING PLANNING (IFA)	1) PLOT PLAN CHECK 2) LIFTING LUG PLANNING 3) SITE ASSEMBLY PLANNING 4) MAJOR EQUIP. ERECTION SCHEDULE (IFD) 5) U/G PIPING CHECK	1) BID TABULATION 2) TECHNICAL EVALUATION 3) VENDOR SELECTION 4) P/O ISSUE
1) BUILDING OUTLINE DWG. (IFC) 2) MAJOR EQUIP. FOUNDATION (IFC) 3) STRUCTURE PLAN & FORMING DWG. (IFD) 4) STORM OILY & CHEM. SEWER TRENCH INFORMATION (IFC) 5) INSERT PLATE MAJOR HANGING FOUNDATION INFORMATION (IFC) 6) PAVING INFORMATION (IFC)	1) CONTRACT 2) CONSTRUCTION SCH. 3) CONSTR. MAT'L SUPPLY SCHEDULE 4) INQUIRY 5) BID TABULATION	1) EXPEDITING 2) INSPECTION 3) TRANSPORTATION PLAN'G 4) INSURANCE
1) PILING (IFC) 2) BUILDING (IFC) 3) STRUCTURE (IFC) 4) PIPE RACK DETAIL (IFC) 5) PLATFORM & WALK WAY DWG. (IFC) 6) EQUIP./MACH. FOUNDATION (IFC) 7) LOCAL FOUNDATION (IFC) 8) B/M & REQUISITION	1) TEST & FLUSHING PLAN'G 2) HEAVY EQUIPMENT TRANSPORT PLAN	
1) FOLLOW UP	1) QUALITY CONTROL 2) COST CONTROL 3) MAT'L CONTROL	

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5. REVISION HISTORY

SEA issue of SPD0001ERN-USA

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