

Engineering Procedure

SAEP-303

31 July, 2002

Engineering Reviews of Project
Proposal and Detail Design Documentation

Document Responsibility: Consulting Services Dept.

Saudi Aramco DeskTop Standards

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1 Scope

- 1.1 This Saudi Aramco Engineering Procedure (SAEP) establishes the guidelines used by Engineering Services (ES) when conducting electronic and hard copy formal engineering reviews of Project Proposals and Detailed Design packages relating to capital and non-capital projects. Requests for these reviews are initiated by Saudi Aramco Project Management (SAPMT). This SAEP does not apply to Design Basis Scoping Papers, Project Construction Method documents, or routine consultation.
- 1.2 The primary intent of a formal engineering review of Project Proposal and Detailed Design documents is to identify noncompliance with the Standards, Specifications, mandatory Standard Drawings, Codes and other mandatory engineering documents applicable to the project.

Depending on the type of review (see Para. 2.3), the engineering review may also provide a check on the engineering soundness, concepts, and calculations used in the design. In addition, it can provide an opportunity to offer alternative design suggestions to bring uniformity and cost effectiveness to Saudi Aramco facilities, recognizing that the later in the project these suggestions are offered, the more difficult it is to incorporate them.
- 1.3 In addition to this SAEP, other Saudi Aramco Engineering Procedures may apply to engineering reviews of Project Proposals and Detail Design documents (e.g., SAEP-13, "Project Environmental Assessments", SAEP-16, "Process Computer Execution Guide", SAEP-21, "Royalty/Custody Metering Facilities Execution Guides", etc.).
- 1.4 Reviews (hard copy or electronic) conducted by Engineering Services do not relieve Saudi Aramco Project Management Team of their responsibility to produce a design that is sound and meets all relevant Saudi Aramco, Industry, International and National Codes and Standards.

2 Definitions

2.1 Organizations and Reviewing Entities

Engineering Departments, Engineering Services - These terms refer to all departments reporting to the Vice President, Engineering Services.

Saudi Aramco Project Management Team (SAPMT) - The SAPMT is the Saudi Aramco organization responsible for overall project activities. The SAPMT has full responsibility for project design, procurement and construction.

2.2 Review Documentation

Project Proposal - A document which establishes the detailed design scope, cost estimate basis, and schedule for a proposed facility from the conceptual requirements included in the Design Basis Scoping Paper. This includes the proposed facility size and general layout and the appropriate functional and performance specifications. Project Proposals should be of sufficient detail to prepare a $\pm 10\%$ accuracy ER estimate, provide sufficient technical information for proponent review and (where applicable) provide sufficient information to obtain LSTK contract bids. (Reference: SAEP-14, "Project Proposal")

Detailed Design - A set of documents used for project construction and material procurement. Detailed Design of a facility is normally carried out after the Project Proposal Meeting and Expenditure Request Approval (ERA).

2.3 Review Types

Conceptual Review - A general review including a random, spot check of the engineering soundness, concepts and calculation methods used in the design. Areas identified as being deficient will be pointed out.

Standards Compliance Review - Compliance with applicable Saudi Aramco, Industry, International and National Codes and Standards will be examined. Any detected deviations will be referenced by the specific standard and paragraph number, if feasible.

Comprehensive Review - A combination of a Conceptual Review and a Standards Compliance Review.

Special Review - All applicable calculations, drawings and specifications will be subjected to a thorough review. If requested by the SAPMT, Engineering Services will provide assistance to rectify specific known or suspected design deficiencies.

Technical Review Team (TRT) Review - A review carried out by a TRT. Usually the TRT is a multi-disciplinary team that will go to the design contractors' offices to review and discuss the design with SAPMT and the design contractor. A TRT review is usually a Comprehensive Review.

2.4 Review Methods

Engineering reviews are generally organized based on one of the two following methods:

Across-the-Board Review (ABR) - This is a review simultaneously carried out by all involved engineering disciplines.

Discipline Specific Review (DSR) - This is a review carried out by a specific engineering discipline. Attachment 1 provides general guidelines and other details for this review method.

These methods may be accomplished by routing hardcopy documents or by utilizing an electronic review process whereby engineering review agent (s) conduct a review at their PC desktops. Refer to Attachment 3 "e-Review Guidelines" for information and resources when conducting an electronic engineering review.

3 Instructions

3.1 Number, Type, and Method of Reviews (See Attachment No. 2)

- 3.1.1 The SAPMT is responsible for establishing the number, type, and method of engineering reviews required for each project.
 - a) Project Proposals generally require a Comprehensive Review.
 - b) Detailed Design Reviews for Lump Sum (LS) and Lump Sum Procure-Build (LSPB) contracts generally require a Comprehensive Review.
 - c) Detailed Design Reviews for Lump Sum Turnkey (LSTK) contracts generally require a Standards' Compliance Review.
- 3.1.2 Unless agreed otherwise, the Project Proposal Review shall be performed on the completed project proposal document developed as a basis for the Technical Review Meeting.
- 3.1.3 SAPMT shall include in the Project Proposal the proposed number, method, and type of the engineering reviews for the Detailed Design phase of the project. Agreement on the anticipated number, method, type and general time frame of reviews for Detailed Design shall be recorded in the Project Proposal Meeting minutes.
 - 3.1.3.1 DSRs shall be carried out at the percent completion stage agreed to by SAPMT and ES during the Project Proposal meeting. Suggested percent completions are given for each discipline in Attachment 1.
 - 3.1.3.2 ABRs shall be carried out at the overall project percent completion stage agreed to by SAPMT and ES during the Project Proposal meeting.

- 3.1.4 For most projects, the following number of formal reviews should be sufficient:
 - one (1) Project Proposal Review, and
 - one (1) Detailed Design Review
- 3.1.5 Some projects may not require a Detailed Design Review due to their simplicity or repetitiveness. Others, due to their complexity, may require an additional Detailed Design Review.
- 3.1.6 Depending on size and technical complexity, some projects may require supplementary (Special and/or TRT) review(s) during the Project Proposal or Detailed Design phase by a TRT. The need for these review(s) shall be determined by SAPMT.

3.2 Forecasting and Requesting Engineering Reviews

- 3.2.1 SAPMT is responsible for achieving agreement with the appropriate Engineering Departments on a schedule for the Project Proposal Technical Review and for the Detailed Design Review. Generally, the schedules should be agreed to at least 60 days prior to the anticipated review date. When conducting an electronic review refer to the attachment 3 "e-Review Guideline", paragraph 11 "Responsibilities" for information regarding preparation and scheduling events.

To request engineering reviews either in the Project Proposal or the Detailed Design phase, the SAPMT should address a letter to the Manager(s) of the appropriate Engineering Department(s) requesting that the review be performed. The letter should state the type of review to be performed, the review format to be used (hard copy or electronic), expected completion date, and the name of the SAPMT representative responsible for coordinating the review.

When an electronic review process is to be conducted the SAPMT shall advise the reviewing departments (agents) in advance to allow sufficient time for the necessary equipment upgrades and training to take place when required.

3.3 Review Schedule

- 3.3.1 In general, engineering reviews of Project Proposals and Detailed Design packages require a minimum of 10 work days and 15 work days, respectively.

If a shorter review duration is desired, SAPMT shall arrange a mutually agreeable review period with the appropriate Engineering Department Manager(s).

If the time required for a review will exceed the agreed upon review period, then the concerned Engineering Department(s) shall agree with the SAPMT on how much additional time will be necessary to perform the review.

- 3.3.2 The review period to perform a Special Review of a specific portion of a design shall be established in advance between the SAPMT and the appropriate Engineering Department(s).

3.4 Review Documentation

- 3.4.1 The following sets of documents shall be submitted to Engineering Services. Documentation should be hard copy unless agreed otherwise. (see Para. 3.4.4)

a) Project Proposal Review

One copy of all documents per reviewing Division.

b) Detailed Design Review

One complete design package per reviewing Division (for ABRs) or one complete design package per reviewing discipline (for DSRs).

- 3.4.2 If required, Engineering Services may request additional copies from the SAPMT.

- 3.4.3 Attachment No. 1 contains guidelines regarding the documentation that should be made available for Detailed Design Review. The first column gives the documentation requested for both ABRs and DSRs. The second column gives the typical percent completion for each discipline recommended for DSRs.

- 3.4.4 All documents provided to Engineering Services for review should normally be hard copy unless the review is to be conducted as an electronic review. Text shall be on 8-½ x 11 inch sheets and drawings can be D sized (11 x 17 inch). Larger sized drawings shall be provided only if legibility is a problem. However, when agreed in advance between SAPMT and Engineering Services reviewing department(s), SAPMT may provide all typed documents in the electronic format currently in general use by the Company. If drawings are agreed to be

provided in electronic format they shall be in accordance with Saudi Aramco Drafting Manual. In no case will both hard copy and electronic copy be required.

Exception:

Hard copy documents (e.g., drawings, scope of work) may not be required when utilizing desk top technologies (e-Review) to conduct project reviews.

4 Responsibilities

4.1 Saudi Aramco Project Management Team (SAPMT)

The SAPMT is responsible for:

1. Obtaining agreement with Engineering Services for:
 - a) the timing of the Project Proposal Review
 - b) the number, method(s), type, timing, and required documentation for Detailed Design Review(s).
2. Forecasting engineering reviews in advance, and notifying appropriate Engineering Department(s) of anticipated reviews.
3. Conducting in-house preliminary reviews prior to requesting an engineering review be performed. Ensuring the functional requirements of the Design Basis Scoping Paper and/or Project Proposal are met. Ensuring that the review documents have been properly checked considering the project completion stage and do not contain errors, such as referring to superseded or canceled Company or Industry Standards.
4. Coordinating all Engineering Services Reviews.
5. Assembling and transmitting review documents to the relevant Engineering Department Manager(s) or their single point contact(s).
6. Providing adequate time for Engineering Services to perform the requested review.
7. Providing any additional documents needed to assist in the review effort (e.g., draft purchase requisitions for items of critical equipment that may need to be issued prior to the scheduled Detailed Design Review).
8. Providing Engineering Services with a mutually acceptable electronic log format for the presentation of their review comments.

9. Resolving Engineering Services review comments and making available to Engineering Services upon request the electronic log showing resolution of comments.
10. Administer the electronic reviews so that the review process appears seamless to the review agents.

4.2 Engineering Services

Engineering Services is responsible for:

1. Reviewing design documents within the agreed time frame.
2. Notifying the SAPMT if the review can not be completed within the period specified by the SAPMT.
3. Providing comments and suggested alternatives where appropriate to correct engineering deficiencies and noncompliances.
4. Recommending further reviews depending on the technical complexity of the project and initial review findings.
5. Establishing a single point contact for the project in each Engineering Department.
6. Providing review comments to SAPMT in the mutually acceptable electronic format.
7. Obtain the necessary skill sets through the Information Technology (IT) training center to conduct the e-Review.

Revision Summary

31 July, 2002

Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with minor/editorial changes.

Attachment 1 – Guidelines for Detailed Design Reviews

In these tables, the first column gives the documentation requested for both ABRs and DSRs. The second column gives details of the requested documentation as well as the typical percent completion for each discipline recommended for DSRs.

Document	Comments
Cathodic Protection	Typical % completion for DSRs = 60%
1 Plot Plans	Show existing and new structures
2 Design Calculations	Include resistivity data
3 Details of Buried Structures	Type, size, material, location
4 Vessels and Tanks Details	Size, contents, foundations, grading
5 Existing C.P. Systems Details	
Civil (Roads, Grading, etc.)	Typical % completion for DSRs = 60%
1 Plot Plans	
2 Calculations - Roads, Grading (Water run off)	100% completion
3 Foundation Location Plans	
4 Site Grading Plans, Layouts, Sections, Details	
5 Foundation Drawings, including details	
Communications	Typical % completion for DSRs = 90%.
1 Scope of Work	
2 Drawings	
3 Project Plan	
4 Material List	
Control Systems	Typical % completion for DSRs = 80%.
1 P&IDs	
2 DCS Block Diagrams	
3 Logic Diagrams	
4 Cause and Effect Diagrams	If there is ESD
5 Control Rooms and PIB Rooms	
6 Hardware Material List	(Preliminary list)
7 DCS Schematics	(Preliminary List)
8 Instrument Loop Diagrams	
9 Estimated I/O Summary Tables	
10 Structured Wiring Design	
11 Architecture Design	
12 Man-Machine Interface Design	
13 Reporting Design	
14 Advanced Control Design	
15 Sequence Control Design (e.g.: OMSB)	

Attachment 1 (Cont'd)

Document		Comments
Electrical		Typical % completion for DSRs = 30%.
1	Electrical Area Classification Drawings	Showing plan and section views
2	Material Specifications for major electrical equipment	Transformers, motors, switchgear, motor control centers, UPS, medium voltage (i.e., >1000 V) switches
3	One Line Diagrams (Overall)	Showing all equipment ratings
4	One Line Diagrams (Substation)	Showing all major equipment ratings (continuous KVA/HP/current, short circuit, interrupting, transformer impedance), basic protective relaying, circuit breaker and/or normal switching positions
5	Substation Drawings	Plan views showing equipment layout inside and outside the building, external elevations of building
6	System studies which form the basis of the equipment ratings shown on the one line diagrams	Should include: - load flow - short circuit - motor starting
Environmental Engineering		Typical % completion for DSRs = 60%.
1	Scope of Work	
2	Plot Plans	
3	PFDs	
4	P&IDs	
5	Calculations	For any equipment with an environmental emission
6	Environmental Impact Assessment	All Reviews
7	Corrosion Control Plan	
Geotechnical		Typical % completion for DSRs = 30%.
1	Scope of Geotechnical Investigation	
2	Geotechnical Report	
3	Foundation Types and Load Indications	
4	Earth Work Plans and Specifications	
5	Construction Procedures for Special Projects	i.e.: evaporation ponds and quay walls

Attachment 1 (Cont'd)

Document	Comments
HVAC	Typical % completion for DSRs = 60%.
1 P&IDs	
2 Specifications	
3 Calculations	
4 System Diagrams	
Instrumentation	Typical % completion for DSRs = 30%.
1 PFDs	Samples (for DSR only)
2 P&IDs	Samples
3 Instrument Installation Schedules	Samples
4 Instrument Specification Sheets	One sample for each different instrument
5 Console/Panel/Rack Drawings (C/P/R)	Only General Layouts
6 Instrument Interconnection Wiring Diagrams	Samples for JB's, Marshaling cabinets, C/P/R drawings
7 Layouts Instrument Points and Lines	Samples
8 ESD System Drawings	Samples of Cause and Effect, Basic Logic Diagram and ESD Logic Narrative
9 Equipment Protection System Drawings	Samples of Basic Logic Diagram, and Logic Narrative
10 Instrument Loop Diagrams	Sample for each different Loop Template
11 System Block Diagram	Full set, should be completed at the start of a project
12 Logic Diagrams and Logic Narrative for Batch or Sequential contro	Samples
Materials & Corrosion Control	Typical % completion for DSRs = 30%.
1 Scope of Work	Submit for background information
2 Process Flow Diagrams	Submit for background information
3 P&IDs	Submit before POs are issued
4 Material Specifications	Submit before POs are issued
5 Equipment Data Sheets	Submit before POs are issued
6 Corrosion Control Plan	

Attachment 1 (Cont'd)

Document		Comments
Paints & Coatings		Typical % completion for DSRs = 50%
1	PFDs	Specify temperature, pressure and fluid composition for internal coatings. Specify temperature for external coatings. Specify insulation, if any. Identify which metallurgies are specified Identify which coatings are specified for which services.
2	Material Specifications and Equipment Data Sheets	
3	Coating "Map"	
Piping		Typical % completion for DSRs = 70%.
1	P&IDs	At least 90% complete.
2	Scope of Work	
3	Piping Material Specifications	
4	Plot Plans	
5	Piping Plans, Layouts, Sections, Details	
6	Isometrics	
7	Piping Support Details	
8	Calculations	
9	Safety Instruction Sheets	
10	Hydrostatic Test Diagrams	
Plant Management Systems		Typical % completion for DSRs =60%
1	Installation & Commissioning Plan	
2	Architecture Design	
3	Application Design	
4	Human Interface Design	
5	Integration Design	
6	Computer Room(s) Design	
7	Structured Wiring Design	
8	Development Plan	
9	Boundary Specification	
Plumbing & Utilities		Typical % completion for DSRs = 60%.
1	P&IDs	
2	Material Specs	
3	Plot Plans	
4	Hazardous Area Classifications	
5	Calculations	
6	Layout Drawings, Sections, and Details	

Attachment 1 (Cont'd)

Document	Comments
Process	Typical % completion for DSRs = 30%.
1 Scope of Work	
2 Project Description (including Utility, Catalyst and Chemical Treatment)	
3 Plot Plans	
4 PFDs	
5 P&IDs	
6 Equipment Data Sheets	
7 Cause & Effect Diagrams	
Rotating Equipment	Typical % completion for DSRs = 90%.
1 PFDs	
2 P&IDs	
3 Equipment Data Sheets	
4 Purchase Specifications	If available or applicable
5 Design Criteria	Process Description
Structural	Typical % completion for DSRs = 90%.
1 Scope of Work	100% completion
2 Plot Plans	100% completion
3 Calculations, including concrete foundations	100% completion
4 Foundation Location Plans	100% completion
5 General Structural Drawings	90% completion
6 Detailed Structural Drawings, including connections and foundations	90% completion
Note: The review of structural steel shop drawings or material take-off's is not considered part of the normal structural design package review.	
Valves	Typical % completion for DSRs = 80%.
1 P&IDs	
2 Material Specs	
3 Piping Layout	Or location of vertical valves
Vessels, Heat Exchangers & Boilers	Typical % completion for DSRs = 20% .
1 P&IDs	
2 Equipment Data Sheets	
Welding	Typical % completion for DSRs = 90%.
1 Material specs and equipment data sheets	Include thicknesses and materials
2 Welding Specs	

Attachment 2 – Summary of Review Applications

	Detailed Design			
	Project Proposal	LSTK	LSPB	LS
Number of reviews (typical)	1	1	1	1
Review Type				
Conceptual	(Note 1)			
Std. Compliance		X		
Comprehensive Review	X (Note 1)		X (Note 1)	X (Note 1)
Special	(Note 2)	(Note 2)	(Note 2)	(Note 2)
Technical Review Team	(Note 2)	(Note 2)	(Note 2)	(Note 2)
Review Method				
Across-the-Board or Discipline Specific	X	X	X	X
Recommended percent completion at the of review	Final draft used at TR meeting		(Note 3)	

Note 1 A Comprehensive Review is a combination of Conceptual Review and Standards Compliance Review.

Note 2 See Para. 2.3 for definition.

Note 3 If an Across-the-Board review method is used, the overall design percent completion will be as agreed between SAPMT and Engineering Services. If a Discipline Specific Review method is used, see Attachment No. 1 for discipline typical progress completion guidelines.

Attachment 3 – e-Review Guidelines

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1. Scope

- 1.1 Saudi Aramco Electronic Engineering Review (e-Review) Process Guidelines are to assist the user groups (SAPMT and review agents) in conducting a quality design drawing/document review.

The purpose of this guideline is to create a resource into which useful and necessary information can be compiled and put into a logical order for easy access when using e-Review.

- 1.2 This Guideline includes but is not limited to the following material:

- Drawing Preparation/Submittal
- Document Preparation/Submittal
- Definitions
- Guideline Information
- Operational Hours
- QA/QC Check Lists
- e-Review User's Manual
- e-Review Roles and Workflow
- Minimum Hardware Requirements

2. Applicable Documents

SAEP 303

*Engineering Reviews Of Project Proposal And
Detailed Design Documentation*

Saudi Aramco Drafting Manual

Specification for E-review Process - Preparation of Electronic Drawings,
Documents & Transmittal Forms

3. Terms and Definitions

Documents: For the purpose of e-Review, "documents" are defined as any electronic document files in Microsoft Office (Word, Excel or PowerPoint), or Adobe Acrobat (.PDF) format.

Drawings: For the purpose of e-Review, "drawings" are defined as electronic CADD drawings in Microstation file format.

Electronic Review: A design review of electronic drawings or documents that is conducted electronically using the e-Review system.

e-Review: The term "e-Review" encompasses all of Saudi Aramco's system for electronic review of design drawings and documents.

e-Review Process: The process that encompasses all of the steps involved in preparing for and conducting all of the electronic reviews for a project using the e-Review system. These steps include submission of reviewers, software installation, training, preparation of design packages, and actual electronic reviews.

e-Review Roles: The roles assigned by each review agency or PMT to their personnel who participate in e-Review. These roles, along with the e-Review workflow system, control who may place comments, approve them, and release them when the review is complete.

P&ID: Piping & Instrumentation Diagram

PFD: Process Flow Diagram

PICU: The Project Information Center Unit within the Project Support & Controls Dept./Project Controls Division. PICU administers the e-Review system.

PMT: Project Management Team, synonymous with SAPMT

ProjectWise: Bentley Systems, Inc. ProjectWise software is a document management system used by Saudi Aramco to manage electronic drawing reviews.

QA/QC: Quality Assurance/Quality Control.

SAPMT: Saudi Aramco Project Management Team.

Workflow: A system for electronically routing drawings for review to the reviewers, supervisors, coordinators, and system administrators sequentially so that each participant has the permissions necessary to do his job at the appropriate time.

Workflow State: A step or stage in the workflow. When a drawing is in the Reviewing state, it is available for reviewers to make comments.

4. **Hardware/Software Requirements**

- 4.1 Minimum hardware requirements for computers used for electronic drawing/document review:
 - 200 MHz Pentium processor
 - 64Mb RAM
 - 30Mb free disk space on C: or D: partition
 - Windows NT or Windows 2000 Professional operating system
- 4.2 Recommended hardware configuration for computers used for electronic drawing/document review:
 - 500 MHz processor
 - 128 Mb RAM
 - 30 Mb free disk space on C: or D: partition
 - Dual-monitor graphics card
 - 2 monitors, at least one of which should be a 21" high-resolution monitor.
 - Windows NT or Windows 2000 Professional operating system
- 4.3 Minimum software requirements:
 - Office 2000
 - Internet Explorer 5.0

5. **Drawing Preparation**

- 5.1 See the definition of "drawings" in Section 3 – Terms and Definitions. All electronic drawings that are to be submitted for electronic review through the e-Review system shall conform to the drafting standards set out in the Saudi Aramco Drafting Manual. In addition, these drawings shall conform to the standards for e-Review drawings as shown in Section 8.1 of the Specification For e-Review Process - Preparation of Electronic Drawings, Documents & Transmittal Forms, included in this guideline as Attachment "A".
- 5.2 Each drawing review package submittal shall include a completed electronic transmittal form prepared according to the specifications set out in Section 8.1 of Attachment "A".

6. **Document Preparation**

- 6.1 See the definition of "documents" in Section 3 – Terms and Definitions. Documents shall conform to the standards for e-Review documents as shown in Section 8.2 of the Specification For e-Review Process - Preparation of Electronic Drawings, Documents & Transmittal Forms, included in this guideline as Attachment "A".
- 6.2 Each document review package submittal shall include a document index in Microsoft Excel format prepared according to the specifications set out in Section 8.2 of Attachment "A".

7. **QA/QC For e-Review Submittals**

- 7.1 The PMT shall conduct a QA/QC exercise prior to forwarding an e-Review package to PICU to ensure that drawings and documents submitted for electronic review comply with the e-Review Specifications included as Attachment "A" to this guideline as well as other applicable standards such as the Saudi Aramco Drafting Manual. As an aid in this QA/QC process, the following resources are provided:
- 7.2 e-Review QA/QC Checklist for Drawings: A concise step-by-step checklist that summarizes each requirement set out in the e-Review Specification included as Attachment "A" to this guideline along with certain specifications from the Saudi Aramco Drafting Manual and requirements for the Electronic Drawing Transmittal. This checklist is included in these guidelines as Attachment "B".
- 7.3 e-Review QA/QC Checklist for Documents: A concise step-by-step checklist that summarizes each requirement set out in the e-Review Specification included as Attachment "A" to this guideline that pertains to documents, including requirements for preparation of the document index that shall accompany each document review submittal. This checklist is included in these guidelines as Attachment "C".

Note: Contact the Supervisor of the PS&CD/Project Information Center (874-7199) regarding questions related to e-Review.

8. **e-Review Roles and Workflow**

8.1 Drawing Review System

The e-Review Drawing Review System, which is managed using Projectwise software, employs a workflow structure to enable access to the drawings for users based on their roles in the electronic review. PICU creates these roles for each participant in the system according to the participant organizations' assignments. These assignments must be

submitted electronically prior to any electronic reviews for a project using the "e-Review User Nomination Form" available from PICU. Participant organizations include both PMT and reviewing agencies.

8.1.1 Roles

8.1.1.1 In e-Review, users are always able to view drawings (read access), but their ability to add, approve or release comments on drawings (write access) is determined by their role and the permissions assigned to that role at different states in the workflow. There are four roles in the e-Review system. A user must be assigned to one of these roles and may be assigned to more than one at a time. These roles are:

- Reviewer
- Supervisor
- Coordinator
- Administrator

8.1.1.2 Role Assignments

It is the responsibility of each organization participating in e-Review, including PMT's and reviewing agencies, to designate the role or roles that they wish to assign to their personnel prior to the start of any of their electronic reviews. In making these assignments, the organization shall observe the following criteria:

Reviewers: Any personnel that will review drawings and make comments on them should be assigned a Reviewer role. A review agency can have as many Reviewers assigned as required, and reviewers may be members of more than one group.

Supervisors: In general there should be no more than one active Supervisor assigned for a single unit or group organized by discipline. Usually the Supervisor role will be assigned to a Unit Supervisor, Division Head or his designee.

Coordinators: The Coordinator role should be assigned to the person that has been designated by

his department as the single point of contact for particular project's reviews and may be the Coordinator for more than one project. There should be only one active Coordinator per department for any single project.

Administrators: The Administrator role is reserved to e-Review System Administrators in PIC.

8.1.2 Workflow Structure

8.1.2.1 Workflow States

The workflow structure determines the permissions that the roles have at different states in the drawing review process. In e-Review, workflows are comprised of four states that are executed sequentially. These states are:

Reviewing - drawings under review, comments added.

Approval - Supervisor checks/approves his unit's comments

Release - Department Coordinator officially releases comments

Archive - Administrator passes comments to PMT.

8.1.2.2 Permissions

Permissions for user roles may be different for each state in the workflow structure. The permissions that each role has during each of the workflow states are as follows:

State	Role	Permissions
Reviewing	Reviewer	CAN add comments to drawings CAN NOT revise others' comments CAN advance drawings to next state in workflow
	Supervisor	CAN add comments to drawings CAN revise others' comments CAN advance drawings to next state in workflow
	Coordinator	View Only
	Administrator	ALL
Approval	Reviewer	View Only

	Supervisor	CAN add comments to drawings CAN revise others' comments CAN advance drawings to next state in workflow OR send drawings back to Reviewing state
	Coordinator	View Only
	Administrator	ALL
Release	Reviewer	View Only
	Supervisor	View Only
	Coordinator	CAN add comments to drawings CAN NOT revise others' comments CAN advance drawings to next state in workflow OR send drawings back to Approval state
	Administrator	ALL
Archive	Reviewer	View Only
	Supervisor	View Only
	Coordinator	View Only
	Administrator	ALL

8.2 Document Review System

The e-Review Document Review system is a web-based system that does not employ either roles or workflow at present. However, it is recommended that document comments be approved by the same Supervisors/Coordinators as the drawing comments prior to their release.

9. Drawing/Document Disciplines

Drawings and documents are classified by discipline according to the Saudi Aramco drawing index system as defined in the Saudi Aramco Drafting Manual. In the e-Review workflow structure, drawings are routed to the reviewing agencies based on the drawing indexes that each agency elects to review. Each review agency shall list the drawing indexes that it will review using the electronic form "e-Review User Nominations" available from PIC.

- Attachment "D" – Saudi Aramco Drawing Indexes, contains a list of these indexes and their definitions.
- Attachment "E" – Drawing Types and Indexes, contains a list of the standard drawing types and their abbreviations used in Saudi Aramco, along with their indexes.

10. Review Notifications

Notifications of a review will only be sent to the Coordinators and Supervisors of reviewing agencies when a review package has been received that contains drawings or documents with indexes that the agency has specified that it wants to review.

Commentary Note:

If a specific review only contains Index "T" communications drawings, then only the reviewing agencies that have indicated that they wish to review Index "T" drawings will be notified of the review.

11. Responsibilities

11.1 Saudi Aramco Project Management Team (SAPMT)

11.1.1 The following is a list of responsibilities that the SAPMT(s) must adhere to in order to successfully conduct an electronic review:

11.1.1.1 Design Packages

Design packages shall:

- Comply with SAEP-303
- Include a cover sheet as specified in SAEP-303 with detailed information regarding the review package, including a list of the percentages of completion for each discipline.

Commentary Note:

Review packages, i.e., electrical, civil, are to be completed to the percentages specified for review of that discipline prior to submittal.

- Have a title for each review package, i.e., "HDGP Process 1 @ 30%".
 - Have all of the necessary design drawings and/or documents that have an association between them in order to conduct a review for a specific engineering discipline. For example, Cause-and-Effect instrumentation drawings rely heavily on references to P&ID drawings, Basic Logic Diagrams and Narratives (written explanation of the logic steps) and any review of such instrumentation drawings must include all of the references as well.
 - Shall not send packages that convey a piecemeal approach to the review content.
-

Commentary Notes:

Example of a complete design package of a building:

- *Scope of Review*
- *Drawing indexes R, Q, M*
- *Structural calculations for all of the structural elements: load derivations, structural modeling & analysis, and design of each structural element such as beams, columns, footings, etc.*

Example of a piecemeal approach for the same building:

- *Drawing index R by itself.*
 - *Later, drawing indexes R & Q and/or M for the building frames with complete structural calculations for the frames.*
 - *Then, drawing indexes R & Q for the foundations with complete calculations for the foundations.*
- Shall not send packages that are duplications of other design drawings (e.g., a facility may have two substations that are identical with the only difference being their locations).

Drawings and Documents

The terms "Drawings" and "Documents" are defined with respect to e-Review in Sections 3 of this document.

In general, "Drawings" consist of engineering design drawings, while "Documents" may include Scopes of Work, Material Take-Offs, Specifications, Calculations, Equipment Data Sheets, etc.

Drawings and Documents submitted for e-Review shall meet certain criteria regarding file format and transmittal information. The attached e-Review Technical Specification sets out these requirements and shall be included in any contract for design services where e-Review is to be used to conduct an electronic review.

11.1.1.2 Point of Contact

There must be a representative from each SAPMT who is designated as a single point of contact and who will serve as the Coordinator for all e-Review activities between the SAPMT and the Project Information Center e-Review System Administrators. The Coordinator shall resolve / coordinate issues that review agents may have concerning project submittals (drawings / documents).

11.1.1.3 QA/QC Plan/Procedure

The SAPMT representative (e.g., Coordinator) shall see that all e-Review submittals have been reviewed to ensure that they:

- Have been reviewed and comply with the preparation specifications.
- Comply with the preparation procedures and that the design contractor has followed the QA/QC steps detailed in the checklists (Attachments "B" and "C");
- Are complete with all supporting documentation (e.g., design calculations, associated drawings);
- Comply with the percentage of completion specifications as required by SAEP-303;
- Comply with the Saudi Aramco Drafting Manual.

11.1.1.4 e-Review Schedule

11.1.1.4.1 The SAPMT shall provide a schedule to the PICU and the review agencies that accurately reflects the following:

- SAPMT is responsible for achieving agreement with the appropriate reviewing agencies on a schedule for the Project Proposal

Technical Review and for the Detailed Design Review. The schedules shall be agreed to at least 60 days prior to the anticipated review date per SAEP-303.

- The date that a design package will be forwarded to the PICU (for the creation of the electronic review).
- The date that the electronic review is to begin and close for the Review Agents.

Commentary Note:

These dates shall comply with the dates that have been agreed to by the review agencies and/or SAEP-303, unless otherwise notified in writing.

- An estimate of the number and type of electronic drawings and documents that will be transmitted for each single package to be reviewed.

11.1.1.4.2 Schedule confirmation and changes

- The SAPMT must negotiate agreement for any deviation from the ten (10) and fifteen (15) day (excluding weekends and holidays) review cycle mandated by SAEP-303 with the reviewing agents and notify PICU of this agreement. Otherwise, PICU will notify the reviewers that the review will close at the close of business on the tenth (10th) working day for project proposal packages and the fifteenth (15th) working day for detailed design packages following the date the review is initiated, as per SAEP-303.

- SAPMT shall confirm the date for delivery of a review package with PICU at least two (2) weeks (10 working days) prior to initiating an electronic review. If confirmation of the delivery date is not received within this time frame, PICU will assume confirmation of the delivery date and schedule its resources accordingly. Failure to meet this date may result in a delay to the electronic review.
- Adequate notice (a minimum of three (3) weeks) of schedule changes shall be provided to PICU and review agents.
- An extended review period will be provided for in the event of an e-Review system outage where access to the documentation has been denied to the reviewers. This extended time should be equal the amount of time that the review documents were not available to reviewers.

11.1.1.5 Comments Resolution

The e-Review system does not include a process to resolve comment issues between the review agent and PMT(s). Therefore, the normal methods / processes of resolving comments between the PMT(s) and the review agents has not changed and should be handled in the normal fashion. Refer to SAEP-303 for information regarding the resolution of comments between PMT(s) and review agents.

11.1.2 Contractor Design agency

- 11.1.2.1 The following is a list of items that must be accomplished by the design contractor in order to prepare for an electronic review:

- Strictly adhere to the Drawing Preparation Procedures;
- Conduct QA/QC reviews in accordance with the QA/QC Checklists (Attachments "B" and "C" to this document) prior to submitting the design package for review;
- Complete the Electronic Drawing Transmittal Form" (refer to the e-Review Specification, Paragraph 8.1.7), using the blank Access database provided by PIC;
- Provide an electronic watermark (stamp) on each drawing that indicates the percentage of completion for the design package at the time of review;
- Comply with the Saudi Aramco Drafting Manual.

11.2 Review Agencies

The following responsibilities are required of the review agency (e.g., department, division, unit, group an or individual) once a commitment has been made to conduct an electronic review.

- Identify review agents and schedule the Saudi Aramco training course (601497) "ProjectWise User Level 1" for each reviewer, as required, 60 days in advance of an electronic review.
- Each user is responsible for coordination with their LAN Administration, computer Help Desk or the PICU e-Review System Administrator to have the e-Review software (*ProjectWise*) installed on his computer. This should be done no later than 30 days prior to the beginning of an electronic review.
- The e-Review agencies/users (to include the PMT members) shall provide PICU with the following information electronically using the "e-Review User Nomination Form" available from PICU at least 30 days prior to a review in order to enable the creation of an account for each of their users in the e-Review system:
 - The title of the project or Job Order number that the reviewer will participate in.

- Complete organizational data, including Department, Division, Unit, and Group as applicable.
 - Drawing indexes that the review agency will review.
 - Full user name, badge number, network login ID, office location, contact telephone number and e-mail address.
 - The user's role within his organization, i.e., Reviewer, Supervisor, Coordinator, or a combination of these roles.
- Review agencies shall have back-up review agents, supervisors and coordinators in the event that one of these key persons is away from his duty assignment during a project review stage.
 - Supervisors and Coordinators shall ensure that their e-mail client has an out-of-office message configured with an alternate contact for times when they will be unavailable so that review notifications can be received and addressed in a timely manner.
 - e-Review system problems shall be reported to the e-Review System Administrator in the PIC.

11.3 Project Information Center

- 11.3.1 The Project Information Center will publish the following information regarding each Electronic Review:
- Design package review type as per SAEP-303, paragraph 2.3;
 - Complete schedule for each project's reviews;
 - The schedule for each individual review;
 - A description of each review;
 - Support documentation for conducting an electronic review;
 - Contact information for PICU and the SAPMT(s);
 - Electronic review schedule changes;
 - e-Review Guideline with attachments.
- 11.3.2 PICU shall notify (forward SAPMT review notification) to the review agencies two (2) weeks (10 working days) prior to the start of an electronic review.

- 11.3.3 PICU will monitor system performance and take appropriate action to optimize it.
- 11.3.4 PICU will provide e-Review Administration System Support from Saturday through Wednesday during the hours from 7:00 AM to 4:00 PM (+3 hours Greenwich Mean Time). After-hours and holidays e-Review Administration System Support will be provided on a call-out basis thereby providing 24/7 (24 hours per day/7 days per week) coverage.
- 11.3.5 PICU will notify users of any system outages due to hardware, software, or network problems.

12. Operational Hours

12.1 Work Week

Saudi Arabia

The work week schedule for Saudi Aramco offices in Saudi Arabia is Saturday through Wednesday during the hours from 7:00 AM to 4:00 PM (+3 hours Greenwich Mean Time), excluding company holidays as shown on the official Saudi Aramco calendar.

12.2 Support Coverage

PICU will provide e-Review Administration System Support as detailed in paragraph 11.3.4 above.

Information Technology will provide hardware system support 24/7. In the event that there is a server outage due to hardware, software or network problems during a review, additional time will be provided for the review agencies to complete the review.

Note: Any review package delivery dates that do not fall on an in-kingdom working day will be arbitrarily moved to the next working day by PICU unless a prior agreement is made between the SAPMT and PICU to begin processing that review package on the date the SAPMT has requested.

13. Resources

ProjectWise User Training Manual: [http://pic-oracle01.dha.aramco.com.sa/e-review/EERP_Training_Manual\[1\].doc](http://pic-oracle01.dha.aramco.com.sa/e-review/EERP_Training_Manual[1].doc)

14. Revision Summary

15. **Attachments**

- Attachment A - Specification for e-Review Process – Preparation of Electronic Drawings, Documents, and Transmittal Forms
- Attachment B - e-Review QA/QC Checklist for Drawings
- Attachment C - e-Review QA/QC Checklist for Documents
- Attachment D - Saudi Aramco Drawing Indexes
- Attachment E - Drawing Types and Indexes
- Attachment F - e-Review User Nomination Form (Sample)

**Attachment A – Specification for e-Review Process – Preparation
of Electronic Drawings, Documents and Transmittal Forms**

**SPECIFICATION
FOR
e-REVIEW PROCESS
PREPARATION OF ELECTRONIC
DRAWINGS, DOCUMENTS & TRANSMITTAL FORMS**

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1. Introduction

- 1.1 The purpose of this specification is to describe the specific requirements for transmittal of electronic drawings and documents to conform to Saudi Aramco requirements for electronic review.
- 1.2 This specification and associated Saudi Aramco documents define the minimum functional specifications and requirements for preparation of drawings, documents and electronic transmittal forms.
- 1.3 DESIGN CONTRACTOR shall regard this document together with the Saudi Aramco Drafting Manual as the basis for preparation of electronic drawings. However, DESIGN CONTRACTOR shall have the responsibility to bring to the attention of the COMPANY in writing any comments, conflicts, or alterations to systems prior to implementation.

2. Scope

- 2.1 This section covers the requirements for preparing and transmitting electronic drawings in accordance with the Saudi Aramco Drafting Manual and Saudi Aramco's standards for electronic drawing review, and preparation of electronic documents in accordance with Saudi Aramco engineering standards and standards for electronic document review. Saudi Aramco will use Bentley Systems ProjectWise software to electronically review drawings prepared by DESIGN CONTRACTOR. Saudi Aramco will use Microsoft Office 2000 Server Extensions to enable review of electronic documents. The term "e-Review" as used in this document will be interpreted as referring to electronic review of drawings and documents using the Bentley Systems ProjectWise software and Microsoft Office 2000.
- 2.2 DESIGN CONTRACTOR shall be responsible for the quality control of the electronic drawings necessary to ensure that these standards and drawing preparation requirements are met.
- 2.3 DESIGN CONTRACTOR shall be responsible for the quality control of documents necessary to ensure that these standards and document preparation requirements are met.
- 2.4 DESIGN CONTRACTOR shall be responsible for the preparation of the electronic transmittal form for each set of drawings and documents submitted for E-Review.

3. Definitions and Acronyms

3.1 Definitions

- 3.1.1 'Shall' and 'must' are used in the imperative sense.
- 3.1.2 'Will' is used in the imperative sense.
- 3.1.3 'May' is used in a permissive sense to state authority or permission to do the act prescribed or prove the function being defined in the prescribed manner, and the words 'no person may...' or 'a person may not...' mean that no person is required, authorised, or permitted to do the act prescribed, and the words 'a ...may not...' mean that the item being described is not required, authorised, or permitted in the prescribed manner.
- 3.1.4 'Includes' means 'includes but not limited to'.

3.2 Acronyms

See Appendix A for acronyms used in this document.

3.3 Terms

See Appendix A for terms used in this document.

4. **Applicable Documents**

See Appendix B for list of applicable documents.

5. **Conflicts and Deviations**

If any inconsistency or conflict exists between this specification and other COMPANY documents, industry standards or drawings, it shall be the responsibility of DESIGN CONTRACTOR to bring the inconsistency to the attention of COMPANY in writing. COMPANY shall resolve the inconsistency/conflict and shall notify DESIGN CONTRACTOR also in writing. Conflicts with the standards listed in section 4 shall not be permitted unless accompanied by a COMPANY pre-agreed waiver per SAEP-302.

6. **Responsibility**

- 6.1 All software and hardware items not specifically mentioned in this specification, but necessary and required, shall be identified and provided by DESIGN CONTRACTOR as part of this package.

- 6.2 Any errors or omissions in this specification shall not absolve DESIGN CONTRACTOR from the responsibility of providing fully functional e-Review drawings and documents as described in this specification.

7. General Requirements

7.1 General Drawing Requirements

- 7.1.1 The following e-Review specifications are above and in addition to the requirements in the Saudi Aramco Drafting Manual and are intended to enable the use of the e-Review software with Microstation drawings that are made in accordance with the Saudi Aramco Drafting Manual. Drawings that are made for e-Review will have additional features that enable hyperlinking, geographical matching of adjacent drawings, and will contain all drawing elements except for the referenced border in a single design file.
- 7.1.2 An Electronic Drawing Transmittal Form must accompany each batch of drawings submitted for e-Review. This form captures all of the information required for the Saudi Aramco form 8135 drawing transmittal form along with additional data required for e-Review.

7.2 General Document Requirements

- 7.2.1 Documents for e-Review must be in either Microsoft Office format (Word, Excel, or PowerPoint) or Adobe Acrobat (.PDF) format.
- 7.2.2 Documents submitted for e-Review must be accompanied by tables of contents as required to communicate the document titles, book titles, section numbers, etc., as appropriate to show the organization of the documents and their disciplines.

8. Specific Requirements

8.1 Specific Requirements for Drawings

- 8.1.1 DESIGN CONTRACTOR shall prepare drawings in accordance with the Saudi Aramco Drafting Manual and as described in this section (Specific Requirements 8.1).
- 8.1.2 Drawing File Name-The computer drawing file name shall use the convention:

AB123456.001 for drawing number AB-123456, Sheet 1

AB123456.002 for drawing number AB-123456, Sheet 2

AB123456.003 for drawing number AB-123456, Sheet 3

8.1.3 Where AB123456 is an eight-character name based on the drawing number, with the first and second characters being letters, and the next six characters being numbers.

8.1.4 Hyperlinks: Wherever a drawing makes reference to another drawing, except in the drawing title box, the other drawing must be referenced by the computer drawing file name using the following convention:

The hyperlink text shall be a separate text string comprised solely of the referenced drawing file name, i.e., it must not be part of a larger text string even if it is physically in a line of text in a note. For example, the note "Refer to drawing DB123456.009 for details", must have the string "DB123456.009" as a separate text string in the line of text.

8.1.5 The exact name used for all references to a drawing shall be used when storing the drawing to disk.

8.1.6 This specification applies to all locations on the drawing where a reference to another drawing is placed except in the drawing title box. This includes, but is not limited to:

Match lines and sheet continuations

Drawing Legends

Notes and comments

Tables

8.1.7 Match Lines-When drawing have match lines, the relevant drawings shall align when viewed together, so that the continuation of the drawing information is aligned. This matching shall be to scale and specific to the geographical location of the information that is continued.

8.1.8 Reference Files-The drawings submitted for E-Review shall have no reference files attached, except for the Saudi Aramco border files which must be attached in accordance with the Saudi Aramco Standards. The DESIGN CONTRACTOR shall ensure that the reference files that may be attached to a

particular drawing at working stages are merged with the drawing.

- 8.1.9 2D-DESIGN CONTRACTOR shall ensure that the drawings submitted for E-Review are all in 2D (two dimensional) format as required by the Saudi Aramco Drafting Manual.
- 8.1.10 Level Settings- DESIGN CONTRACTOR shall ensure that the Microstation windows attributes and level settings are consistent for all windows (1 through 8) of the design file.
- 8.1.11 Electronic Drawing Transmittal Form - Saudi Aramco will provide DESIGN CONTRACTOR with an electronic version of the SA 8135 form for drawing transmittal in the form of a Microsoft Access 2000 Database. DESIGN CONTRACTOR shall submit a correctly completed Electronic Drawing Transmittal Form with each batch of drawings submitted for E-Review. Certain fields in the database are required while others are optional. Two fields, the Drawing Type and the Building Number, are not applicable for every drawing, but are required for those drawings to which they apply. For example, Index "A" drawings must always have a drawing type. Any drawing that pertains to a particular building must have the building number field filled in. The following table lists the fields in the Electronic Drawing Transmittal Form with the required fields specified.

1 st Column	1 st character of the drawing's file name:	Required
2 nd Column	2 nd Character of the drawing's file name:	Required
3 rd Column	The six (6) digits of the drawing's file name:	Required
4 th Column	The sheet number (e.g., 001,002), etc.	Required
5 th Column	Revision number	Optional
6 th Column	Drawing index1 (e.g., AB123456)	Required
7 th Column	Drawing Index2 (e.g., AB123456)	Optional
8 th Column	Drawing Index3 (e.g., AB123456)	Optional
9 th Column	Drawing Type	Required If Applicable
10 th Column	Building Number	Required If Applicable
9 th Column	Drawing title	Required
10 th Column	Job order	Optional
11 th Column	Plant No.1	Optional
12 Column	Plant No.2	Optional
13 Column	Plant No.3	Optional
14 th Column	Drawing File Name	Required

The Database Structure shall not be modified.

- 8.1.12 DESIGN CONTRACTOR shall produce an appropriate project procedure, approved by Saudi Aramco, covering preparation of drawings for e-Review, QA/QC, preparation of the Electronic Drawing Transmittal Form, electronic transfer method, and transmittal to Saudi Aramco.

8.2 Specific Requirements for Documents

- 8.2.1 Documents for e-Review must be in either Microsoft Office format (Word, Excel, or PowerPoint) or Adobe Acrobat (.PDF) format.
- 8.2.2 Where documents submitted for e-Review comprise a series of books, the documents files must be divided into groups according to the book structure, i.e., Process, Control & Instrumentation, Utilities & Offsites, etc., must be grouped into separate folders identified by the book title. Each group must be accompanied by a table of contents in Excel format, and there must also be a list of the books by title in Excel format.
- 8.2.3 Where documents submitted for e-Review are not organized into books, a single table of contents in Excel format must accompany the submittal.
- 8.2.4 Tables of contents must contain, as a minimum, the title of each document and its electronic file name.
- 8.2.5 Tables of contents should contain additional data where available for each document, such as section/document number, drawing type if applicable, and drawing index if applicable.
- 8.2.6 The electronic file name, including extension, for each document submitted must be included in the table of contents, i.e., a document in MS Word format that is named BE123456 would have a file name BE123456.DOC.

9. Quality Assurance

- 9.1 Quality Assurance shall be implemented and checklist signed off by the QA inspector to ensure that the delivered product meets the requirements of applicable specifications and standards.
 - 9.2 Saudi Aramco may, at its discretion, provide software to automate certain parts of the QA/QC process. In this event, DESIGN CONTRACTOR will incorporate this software into its QA/QC process.
-

10. **Documentation**

DESIGN CONTRACTOR shall submit drawings and documents for e-Review together with the associated ELECTRONIC DRAWING TRANSMITTAL FORM electronically or on electronic media as agreed with Saudi Aramco. If electronic media such as a CD is used, it shall be labelled to indicate its contents. A paper transmittal document shall accompany the electronic media, containing additional information as follows:

DESIGN CONTRACTOR's originating engineer responsible for the drawing submittal.

Saudi Aramco response co-ordinator

Drawing types

Reason for e-Review issue

Appendix A - Acronyms and Definitions

Acronyms

ANSI	American National Standards Institute
API	American Petroleum Institute
BI	Budget Item
CADD	Computer aided Design and Drafting
CSA	Canadian Standards Association
CENELEC	European Committee for Normalization
Hz	Hertz
IEEE	Institute of Electrical and Electronics Engineers
LSTK	Lump Sum Turn Key
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NMR	Non-Material Requirements
OCC	Operations Control Center in Dhahran
OCR	Optical Character Recognition
PC	Personal Computer
QA/QC	Quality Assurance/Quality Control
RFI	Radio Frequency Interference
RP	Recommended Practice
SACS	Saudi Aramco CADD Standards
SADM	Saudi Aramco Drafting Manual
SAES	Saudi Aramco Engineering Standards
SAMA	Scientific Apparatus Makers Association
SAMSS	Saudi Aramco Materials System Specification
UL	Underwriters Laboratory

Definitions

COMPANY	Saudi Aramco
LSTK CONTRACTOR	The Lump Sum Turn Key CONTRACTOR
Saudi Aramco	Refers to any of the following Saudi Arabian organizations: Aramco Services Company, Aramco Overseas Company, Saudi Aramco

Appendix B - Applicable Documents

The described herein shall comply with the latest edition of the references listed below which are considered part of this specification.

Saudi Aramco

SAEP-128

SACS

SADM

Attachment B - e-Review QA/QC Checklist for Drawings

e-Review Drawing QA/QC Checklist			
Item	Description	Yes	No
1	Drawing file name is in the format specified by Saudi Aramco Drafting Standards, i.e., "PP123456.001". (See e-Review Spec. 8.1.1)		
2	All references to other drawings EXCEPT in the drawing title box are by drawing file name, not drawing number. (Hyperlinks, see e-Review Spec. 8.1.2)		
3	All hyperlinks to other drawings are a single text string and do not contain any other text than the file name of the drawing that is referenced. (See e-Review Spec. 8.1.2)		
4	The filename contained in the drawing transmittal form EXACTLY matches the actual filename under which the drawing is stored. (See e-Review Spec. 8.1.2.2)		
5	Match lines between adjacent drawings match geographically so that drawings line up when viewed together. (See e-Review Spec. 8.1.3)		
6	All reference files EXCEPT the border file have been merged into the main drawing. (See e-Review Spec. 8.1.4)		
7	All drawings are 2D drawings. (See e-Review Spec. 8.1.5)		
8	All level settings and window attributes are the same for all windows of the design files. (See e-Review Spec. 8.1.6)		
9	All REQUIRED or REQUIRED IF APPLICABLE fields of the electronic drawing transmittal form are filled in. (See e-Review Spec. 8.1.7)		

Attachment C – e-Review QA/QC Checklist for Documents

e-Review Document QA/QC Checklist			
Item	Description	Yes	No
1	Documents are all in MS Word, Excel, PowerPoint or Adobe PDF format. (See e-Review Spec. 8.2.1)		
2	If documents comprise a set of books, a table is provided in Excel 2000 format listing the book names. (See e-Review Spec. 8.2.2)		
3	If documents comprise a set of books, the document files are divided into separate folders according to the book structure and folders are named with the book names. (See e-Review Spec. 8.2.2)		
4	If documents comprise a set of books, each book has its own table of contents in Excel format containing as a minimum the document titles and their EXACT filenames. (See e-Review Spec. 8.2.2 and 8.2.4)		
5	If documents are all part of one book, there is a single table of contents in Excel format containing as a minimum the document titles and their EXACT filenames. (See e-Review Spec. 8.2.3 and 8.2.4)		
6	If additional data such as drawing indexes or section numbers is required for clarity, these are contained in the table of contents. (See e-Review Spec. 8.2.5)		
7	The electronic file name of each document submitted is contained in the table of contents and corresponds EXACTLY to the actual filename under which the document is stored, INCLUDING EXTENSION. (See e-Review Spec. 8.2.6)		

Attachment D – Saudi Aramco Drawing Indexes

Saudi Aramco Drawing Indexes	
Index	Description
A	General
B	Loss Prevention
C	Columns
D	Vessels
E	Heat Exchangers
F	Furnaces
G	Liquid Handling Equipment
H	Paints/Coatings
J	Instrumentation
K	Gas Handling/HVAC Equipment
L	Piping
M	Steel/Steel Structures
N	Insulation
P	Electrical Power Systems
Q	Concrete
R	Building Architecture
S	Utility Services/Civil Works
T	Communications
U	Special Equipment
V	Railroad and Marine
W	Welding
X	Cathodic Protection
Y	Royalty and Custody Measurement
Z	Process Computers

Attachment E – Drawing Types and Indexes

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
ABB	ABBREVIATION	ABBREVIATION	A	GENERAL
HVA	A/C AUTOMATIC CONTR. SYSTEM	A/C AUTO CONTR	J	MECHANICAL
HVA	A/C PIPING DETAIL	A/C PIPING DET	S	MECHANICAL
HVA	AC DUCT FABRICATION	AC DUCT FAB	K	MECHANICAL
HVA	AC DUCT LAYOUT AND DETAIL	AC DUCT DET	K	MECHANICAL
EWD	ANALOG WIRING	ANALOG WIRING	J	INSTRUMENT
SCH	ANCHOR BOLT SCHEDULE	ANCH BOLT SCH	M	CIVIL
PNL	ANNUNCIATOR BOARD	ANNUN. BOARD	J	INSTRUMENT
HAZ	AREA CLASSIFICATION	AREA CLASSIF	A	GENERAL
HAZ	AREA CLASSIFICATION	AREA CLASS	B	MECHANICAL
FPP	AREA MAPS	AREA MAP	A	CIVIL
SDT	ASSEMBLY AND DETAIL	ASSY & DET	M	CIVIL
FPS	AUTO SPRINKLER - FIRE PROTECTION	AUTO SPRINKLER	S	MECHANICAL
ARC	BEAM SECTION	BEAM SECT.	Q	ARCHITECTURE
MTL	BILL OF MATERIAL	BILL OF MTL	A	GENERAL
SCM	BLOCK DIAGRAM	BLOCK DIAG	J	INSTRUMENT
ARC	CABINETS AND CARRIERS	CAB/ CARRIERS	R	ARCHITECTURE
CBL	CABLE AND CONDUIT LAYOUT	CA & CND L/O	P	ELECTRICAL
CCS	CABLE AND CONDUIT SCHEDULE	CABLE/CND SCH	P	ELECTRICAL
CBL	CABLE DETAIL	CABLE DETAIL	P	ELECTRICAL
CBL	CABLE LAYOUT	CABLE LAYOUT	P	ELECTRICAL
FDN	CABLE MANHOLE DETAIL	CA MANHOLE DET	Q	CIVIL
CBL	CABLE ROUTING	CABLE ROUTING	P	ELECTRICAL
SCH	CABLE RUNNING LIST	CABLE LIST	P	ELECTRICAL
CBL	CABLE TRAY DETAILS	CA TRAY DET	P	ELECTRICAL
CBL	CABLE TRAY LAYOUT	CA TRAY LAYOUT	P	ELECTRICAL
SCH	CABLE TRAY LOADING SCHEDULE	CA TRAY SCH	P	ELECTRICAL
SDT	CABLE TRAY SUPPORT DETAIL	CA TRAY SUPT	M	CIVIL
EPD	CABLE TRENCH AND DUCT BANK LAYOUT	CA TRENCH/DUCT	P	ELECTRICAL
CBL	CABLE VAULT	CABLE VAULT	P	ELECTRICAL
DOC	CALCULATION SHEET	CALC. SHEET	A	GENERAL
GEN	CANCEL	CANCELLED	A	GENERAL
FDN	CATCH BASIN DETAIL	C/BASIN DET	Q	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
CAT	CATHODIC PROTECTION	CATH. PROTECT	X	ELECTRICAL
SDT	CHORD BRACING	CHORD BRACING	M	CIVIL
EWD	CIRCUIT DIAGRAM	CIRCUIT DIAG	P	ELECTRICAL
SDT	CLAMP DETAIL	CLAMP DETAIL	M	CIVIL
COM	COMMUNICATION SYSTEM LAYOUT	COMM SYS L/O	T	INSTRUMENT
ARC	CONCRETE AND WOODEN FRAME BUILDINGS	CONC/WOOD BLDG	R	ARCHITECTURE
FDN	CONCRETE DIKE	CONCRETE DIKE	Q	CIVIL
FDN	CONCRETE RETAINING WALL	RETAINING WALL	Q	CIVIL
FDN	CONCRETE SLEEPER	CONC. SLEEPER	Q	CIVIL
CBL	CONDUIT & JUNCTION BOX ARRANGEMENT	CND/JB ARR'GT	P	ELECTRICAL
CBL	CONDUIT INSTALLATION DETAIL	CND INSTL DET	P	ELECTRICAL
CBL	CONDUIT INSTALLATION PLAN	CND INSTL PLN	P	ELECTRICAL
ECD	CONNECTION DIAGRAM	CONN. DIAG	P	ELECTRICAL
SCH	CONNECTION SCHEDULE	CONN SCHEDULE	P	GENERAL
EQA	CONSOLE ARRANGEMENT	CONSOLE ARR'GT	P	ELECTRICAL
ANT	CONSTRUCTION & PLACEMENT COMM. TOWE	COMM TWR CONST	M	CIVIL
ANT	CONSTRUCTION AND PLACEMENT ANTENNA	ANTENNA CONSTR	M	CIVIL
DOC	CONSTRUCTION BAR CHART	CONSTR BAR SCH	A	GENERAL
ARC	CONSTRUCTION DETAILS	CONST DET	Q	CIVIL
KEY	CONSTRUCTION LAYDOWN AREA	LAYDOWN AREA	A	CIVIL
DOC	CONSTRUCTION SCHEDULE	CONSTR SCH	A	GENERAL
DOC	CONSTRUCTION SEQUENCE PLANNING	CONST SEQ PLAN	A	GENERAL
FSH	COVER SHEET	COVER SHEET	A	GENERAL
DOC	CRITICAL PATH METHOD DIAGRAM	CRIT PATH DIAG	A	GENERAL
SCH	CROSS CONNECT WIRE SCHEDULE	CONN WIRE SCH	P	ELECTRICAL
SSD	CROSSING BERMS AND ROADS SSD FENCE	RD X-ING FENCE	M	CIVIL
SSD	CULVERT SECURITY SHIELD	CULVERT SHIELD	M	CIVIL
DTA	DATA COMMUNICATIONS	DATA COMM.	T	INSTRUMENT
DAT	DATA SHEET	DATA SHEET	A	GENERAL
SDT	DETAIL DRAWING	DETAIL DWG	M	CIVIL
EWD	DIGITAL SIGNAL WIRING	DIGITAL W/DIAG	J	INSTRUMENT
ARC	DOOR AND WINDOW ARRANGEMENT	DOOR/W ARR'GT	R	ARCHITECTURE

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
SCH	DOORS AND WINDOWS SCHEDULE	DOOR/W SCH	R	ARCHITECTURE
PLB	DRAIN/WASTE AND VENT PIPING	DRAIN/VENT PLB	S	MECHANICAL
DSC	DRAWING CONTROL SHEET	DWG CONTR. SHT	A	GENERAL
ABB	DRAWING LEGEND	DWG LEGEND	A	GENERAL
ABB	DRAWING LEGEND AND NOTES	LEGEND/NOTES	A	GENERAL
DSC	DRAWING STATUS CONTROL	DWG STATUS	A	GENERAL
SDT	DUCT SUPPORT	DUCT SUPPORT	M	CIVIL
DUP	DUPLICATE	DUPLICATE	A	GENERAL
GAP	EARTH WORK	EARTH WORK	S	CIVIL
HAZ	ELECTRICAL AREA CLASSIFICATION	ELEC A/CLASSIF	P	ELECTRICAL
EDT	ELECTRICAL ASSEMBLY	ELEC. ASSY	P	ELECTRICAL
EDT	ELECTRICAL DETAIL	ELEC. DET	P	ELECTRICAL
EDT	ELECTRICAL LAYOUT	ELEC. LAYOUT	P	ELECTRICAL
E1L	ELECTRICAL ONE LINE DIAGRAM	ONE LINE DIAG	P	ELECTRICAL
EDT	ELECTRICAL PLAN	ELEC. PLAN	P	ELECTRICAL
ELM	ELEMENTARY DIAGRAM	ELEM. DIAG	P	ELECTRICAL
ARC	ELEVATION	ELEVATION	R	ARCHITECTURE
ARC	ELEVATION, SECTIONS AND DETAILS	ELEV/SECT/DET	R	ARCHITECTURAL
ARC	ELEVATIONS AND SECTIONS	EL & SECT	R	ARCHITECTURE
LTG	EMERGENCY LIGHTING SYSTEM	EMER LTG SYS	P	ELECTRICAL
PLB	EQUIP.AND SANITARY FIXTURE LIST	FIXTURE LIST	S	MECHANICAL
SDT	EQUIPMENT ANCHORAGE DETAIL	EQUIP ANCHOR	M	CIVIL
EQA	EQUIPMENT ARRANGEMENT	EQUIP ARR'G'T	A	MECHANICAL
EQD	EQUIPMENT ASSEMBLY	EQUIP ASSY	A	MECHANICAL
EQD	EQUIPMENT ASSEMBLY AND DETAILS	EQUIP ASSY DET	C	MECHANICAL
EQD	EQUIPMENT ASSEMBLY AND DETAILS	EQUIP ASSY DET	D	MECHANICAL
EQD	EQUIPMENT ELEVATION AND DETAILS	EQUIP ELEV DET	A	MECHANICAL
EQD	EQUIPMENT ELEVATION AND SECTION	EQUIP EL/SECT	A	MECHANICAL
FDN	EQUIPMENT INSTALLATION DETAIL	EQUIP INSTALL	Q	MECHANICAL
EQA	EQUIPMENT LAYOUT	EQUIP LAYOUT	A	MECHANICAL
EQA	EQUIPMENT LEGEND	EQUIP LEGEND	A	MECHANICAL
DOC	EQUIPMENT LIST	EQUIPMENT LIST	A	GENERAL
EQA	EQUIPMENT LOCATION PLAN	EQUIP LOC PLAN	A	MECHANICAL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
ISS	EQUIPMENT SPECIFICATION	EQUIP SPEC	A	GENERAL
SDT	EXPANSION JOINTS DETAIL	EXPAN JOINT	Q	CIVIL
ARC	EXTERIOR FINISH DETAIL	EXT.FINISH DET	R	ARCHITECTURE
SDT	FABRICATION DETAIL	FAB DETAIL	A	MECHANICAL
SDT	FABRICATION DETAIL	FAB DETAIL	M	CIVIL
FSH	FACE SHEET	FACE SHEET	A	GENERAL
KEY	FACILITY INDEX MAP	FAC INDEX MAP	A	CIVIL
FPP	FACILITY PLOT PLAN	FAC PLOT PLAN	A	MECHANICAL
SDT	FENCE AND GATE DETAIL	FENCE/GATE DET	M	CIVIL
SDT	FENCE DETAIL	FENCE DETAIL	M	CIVIL
IPD	FIELD MOUNTING DETAIL	FIELD MTG DET	J	INSTRUMENT
ARC	FINISH SCHEDULE	FINISH SCH.	R	ARCHITECTURE
FPS	FIRE BREAKS AND FIRE WALLS	FIRE WALLS	B	MECHANICAL
HAZ	FIRE HAZARDOUS AREA	FIRE HAZ AREA	B	MECHANICAL
FPS	FIRE PROOFING	FIRE PROOFING	B	MECHANICAL
FPS	FIRE PROTECTION SYSTEM	FIRE PROT SYS	S	MECHANICAL
ARC	FLOOR FINISHES DETAILS	FL FIN. DETAIL	R	ARCHITECTURAL
SDT	FLOOR PLAN	FLOOR PLAN	M	CIVIL
ARC	FLOOR PLAN	FLOOR PLAN	R	ARCHITECTURE
FLN	FLOWLINES AND TRUNKLINES	F/L & T/LINES	L	MECHANICAL
FDN	FORMWORKS	FORMWORKS	Q	CIVIL
FDN	FORMWORKS AND REINFORCEMENT DETAILS	FORMS & REINF	Q	CIVIL
FDN	FOUNDATION DETAIL	FDN DETAIL	Q	CIVIL
FDN	FOUNDATION LAYOUT	FDN LAYOUT	Q	CIVIL
FDN	FOUNDATION LOCATION KEY PLAN	FDN KEY PLAN	Q	CIVIL
FDN	FOUNDATION PLAN	FDN PLAN	Q	CIVIL
FDN	FOUNDATION SECTION	FDN SECTION	Q	CIVIL
SDT	FRAMING DETAIL	FRAMING DET	M	CIVIL
SDT	FRAMING DETAIL	FRAMING DET	M	CIVIL
SDT	FRAMING ELEVATION	FRAMING ELEV	M	CIVIL
SDT	FRAMING ELEVATION	FRAMING ELEV	M	CIVIL
SDT	FRAMING PLAN	FRAMING PLAN	M	CIVIL
SDT	FRAMING PLAN	FRAMING PLAN	M	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
SDT	FRAMING PLAN AND ELEVATION	FRAM'G PLN/ELE	M	CIVIL
SDT	FRAMING SECTION	FRAMING SECT	M	CIVIL
SDT	FRAMING SECTION	FRAMING SECT	M	CIVIL
LOG	FUNCTIONAL DIAGRAM	FUNCT DIAG	A	GENERAL
ARC	FURNISHING	FURNISHING	R	ARCHITECTURE
SDT	GATE PLOT PLAN AND DETAIL	GATE/PLOT PLAN	M	CIVIL
KEY	GENERAL LAYOUT PLAN	LAYOUT PLAN	A	CIVIL
DOC	GENERAL NOTES	GENERAL NOTES	A	GENERAL
GAP	GEOGRAPHICAL LOCATION	GEOGRAPHIC LOC	S	CIVIL
GAP	GEOLOGICAL SECTION	GEOLOGICAL SEC	S	CIVIL
GAP	GRADING AND PAVING	GRADE&PAVING	S	CIVIL
PNL	GRAPHIC PANEL	GRAPHIC PANEL	J	INSTRUMENT
DOC	GRAPHS AND CHARTS	GRAPHS/CHARTS	A	GENERAL
CBL	GROUNDING DETAIL	GROUNDING DET	P	ELECTRICAL
CBL	GROUNDING LAYOUT	GROUNDING L/O	P	ELECTRICAL
CBL	GROUNDING PLAN	GROUNDING PLAN	P	ELECTRICAL
FPS	HALON FIRE PROTECTION SYSTEM	HALON PROT SYS	B	MECHANICAL
EDT	HANDHOLE DETAIL	HANDHOLE DET	P	ELECTRICAL
SDT	HANDRAIL DETAIL	HANDRAIL DETAIL	M	CIVIL
HAZ	HAZARDOUS AREA CLASSIFICATION	HAZ AREA CLASS	B	MECHANICAL
PFD	HEADER DIAGRAM	HEADER DIAG	A	MECHANICAL
SCM	HEAT BALANCE DIAGRAM	HEAT BAL DIAG	A	MECHANICAL
HVA	HEAT/VENTILATING & AIR CONDITIONING	HVAC	K	MECHANICAL
ISS	HOT TAP SPECIFICATION	HOT TAP SPEC	A	MECHANICAL
HVA	HVAC CHILLED WATER AND REFR. PIPING	CHILLED W & REF	K	MECHANICAL
HVA	HVAC CHILLED WATER PIPING	HVAC WTR PIP'G	K	MECHANICAL
HVA	HVAC DETAIL	HVAC DETAIL	K	MECHANICAL
HVA	HVAC DIAGRAM	HVAC DIAGRAM	K	MECHANICAL
HVA	HVAC DUCT SECTIONS AND DETAILS	AC DUCT SECTION	K	MECHANICAL
HVA	HVAC EQUIPMENT	HVAC EQUIPMENT	K	MECHANICAL
HVA	HVAC FLOOR PLAN	HVAC FLOOR PLN	K	MECHANICAL
HVA	HVAC LAYOUT	HVAC LAYOUT	K	MECHANICAL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
HVA	HVAC LEGEND	HVAC LEGEND	K	MECHANICAL
HVA	HVAC MATERIAL	HVAC MATERIAL	K	MECHANICAL
HVA	HVAC PLAN	HVAC PLAN	K	MECHANICAL
HVA	HVAC PLAN,SECTIONS AND DETAILS	HVAC PLAN & DET	K	MECHANICAL
HVA	HVAC SECTION	HVAC SECT	K	MECHANICAL
HVA	HVAC SYMBOLS AND LEGEND	HVAC SYM & LEGD	K	MECHANICAL
HGR	HYDROGRAPHIC MAP	HYDROG MAP	A	CIVIL
HYD	HYDROSTATIC TEST DIAGRAM	HYDROST DIAG	A	MECHANICAL
FSH	INDEX SHEET	INDEX SHT	J	INSTRUMENT
DOC	INSPECTION RECORD	INSP RECORD	A	GENERAL
ILD	INST LOOP DIAG	ILD	J	INSTRUMENT
IPD	INSTRUMENT ASSEMBLY	INST ASSY	J	INSTRUMENT
IPL	INSTRUMENT CONDUIT ROUTING PLAN	INST CND ROUTG	J	INSTRUMENT
EQD	INSTRUMENT CONNECTION DETAILS	INST CONN. DET	J	INSTRUMENT
SCH	INSTRUMENT CONNECTION SCHEDULE	INST CONN SCH	J	INSTRUMENT
IDT	INSTRUMENT DETAIL	INST DETAIL	J	INSTRUMENT
DOC	INSTRUMENT INSPECTION SCHEDULE	INSTR INSP SCH	A	INSTRUMENT
IPD	INSTRUMENT INSTALLATION DETAIL	INST INSTL DET	J	INSTRUMENT
IIS	INSTRUMENT INSTALLATION SCHEDULE	INST INSTL SCH	J	INSTRUMENT
IDT	INSTRUMENT LAYOUT	INST LAYOUT	J	INSTRUMENT
IPD	INSTRUMENT LAYOUT	INST LAYOUT	J	INSTRUMENT
IPL	INSTRUMENT LOCATION AND CONDUIT	INST LOC & CND	J	INSTRUMENT
IPD	INSTRUMENT LOCATION PIPING	INST LOC PIP'G	J	INSTRUMENT
IPL	INSTRUMENT LOCATION PLAN	INST LOC PLAN	J	INSTRUMENT
FDN	INSTRUMENT MANHOLE DETAIL	INST. M/H DET	Q	CIVIL
IPD	INSTRUMENT MOUNTING DETAIL	INST MTG DET	J	INSTRUMENT
PNL	INSTRUMENT PANEL	INST PANEL	J	INSTRUMENT
IPD	INSTRUMENT PIPING DETAIL	INST PIP'G DET	J	INSTRUMENT
ISO	INSTRUMENT PIPING ISOMETRIC VIEW	ISO INST PIP'G	L	MECHANICAL
IPD	INSTRUMENT PLAN	INST PLAN	J	INSTRUMENT
IPL	INSTRUMENT POINTS AND LINES	INST P/T LINES	J	INSTRUMENT
IPD	INSTRUMENT SAMPLE PIPING	INST SAM PIP'G	J	INSTRUMENT
IDT	INSTRUMENT SECTION	INST SECTION	J	INSTRUMENT

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
IPD	INSTRUMENT SECTION	INST SEC	J	INSTRUMENT
ISS	INSTRUMENT SPECIFICATION SHEET	INST SPEC SHT	J	INSTRUMENT
INS	INSULATION DETAIL	INSULAT'N DET	N	GENERAL
FDN	INTERCEPTOR PIT DETAIL	INTER. PIT DET	Q	CIVIL
ECD	INTERCONNECTION DIAGRAM	INTERCONN DIAG	P	ELECTRICAL
ARC	INTERIOR FINISH DETAIL	INT.FINISH DET	R	ARCHITECTURE
PLB	ISOMETRIC DIAGRAM	ISO DIAG	S	MECHANICAL
E1L	ISOMETRIC PIPING DETAIL	ISO PIP'G DET	P	MECHANICAL
KEY	KEY PLAN	KEY PLAN	A	CIVIL
SDT	LADDER ASSEMBLY	LADDER ASSY	M	CIVIL
SDT	LADDER DETAILS	LADDER DET	M	CIVIL
GAP	LANDSCAPING	LANDSCAP'G	S	ARCHITECTURE
GAP	LANDSCAPING AND PATIO DETAIL	LANDSCAP'G DET	S	ARCHITECTURE
APP	LAYOUT OF APPURTENANCES	L/O APPURTEN'S	A	MECHANICAL
GAP	LAYOUT OF PARKING LOT	L/O PARK'G LOT	S	CIVIL
PLB	LIFT-UP PUMP	LIFT-UP PUMP	G	MECHANICAL
LTG	LIGHTING AND GROUNDING LAYOUT	LTG & GRND L/O	P	ELECTRICAL
LTG	LIGHTING DETAIL	LIGHTING DET	P	ELECTRICAL
LTG	LIGHTING FIXTURE ARRANGEMENT	LTG FIX ARR'G'T	P	ELECTRICAL
LTG	LIGHTING INSTALLATION DETAIL	LTG INSTAL DET	P	ELECTRICAL
LTG	LIGHTING LAYOUT	LIGHTING L/O	P	ELECTRICAL
SCH	LIGHTING PANEL SCHEDULE	LTG PANEL SCH	P	ELECTRICAL
LTG	LIGHTING PLAN	LIGHTING PLN	P	ELECTRICAL
LDT	LINE DESIGNATION TABLE	LINE DES TABLE	A	MECHANICAL
MTL	LIST OF MATERIAL	MATERIAL LIST	A	GENERAL
SDT	LIST OF PIPE SUPPORTS	PIPE SUPT LIST	M	CIVIL
SCH	LIST OF TIE-INS	LIST TIE-INS	A	MECHANICAL
PNL	LOCAL CONTROL PANEL	LOC CONTR PNL	J	INSTRUMENT
KEY	LOCATION PLAN	LOC PLAN	A	CIVIL
LOG	LOGIC DIAGRAM	LOGIC DIAG	J	INSTRUMENT
DOC	LUBRICATION CHARTS	LUB. CHARTS	A	MECHANICAL
MDF	MAIN DISTRIBUTION FRAME	DISTR FRAME	A	ELECTRICAL
FDN	MANHOLE DETAILS	MANHOLE DET	Q	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
FPP	MASTER PLOT PLAN	MAS PLOT PLAN	A	ARCHITECTURE
SDT	MEMBER SCHEDULE	MEMBER SCH.	M	CIVIL
GEN	MERGED	MERGED	A	GENERAL
DOC	METER READING TABLE	METER TABLE	A	GENERAL
DOC	METERING FACTORS	METER FACTORS	A	GENERAL
ARC	MISC. DETAILS	MISC. DETAILS	R	CIVIL
MDT	MISCELLANEOUS MECHANICAL DETAILS	MECH DET	A	MECHANICAL
GAP	MONUMENT REFERENCE	MONUMENT REF.	S	CIVIL
MCC	MOTOR CONTROL CENTER	MTR CONTR CTR	P	ELECTRICAL
SCH	NAMEPLATE DETAIL	NAMEPLATE DET	A	GENERAL
SCH	NAMEPLATE SCHEDULE	NAMEPLATE SCH	A	GENERAL
SCM	NET WORK CONFIGURATION	NET WRK CONFIG	A	GENERAL
GEN	NO OLD TITLE	NO OLD TITLE	A	GENERAL
GEN	NOT CLEAR	NOT CLEAR	A	GENERAL
SDT	OFFSHORE PLATFORMS	P/F OFFSHORE	M	CIVIL
DOC	OIL/GAS DISPATCH SYSTEM	OIL/G DISPATCH	A	MECHANICAL
FDN	OIL-WATER SEPARATOR PLAN	OIL-W SEP PLAN	Q	CIVIL
SCM	OPERATING DIAGRAM	OPERAT'G DIAG	A	GENERAL
DOC	OPERATING INSTRUCTIONS	OPR INSTRUCT'N	A	GENERAL
SDT	OPERATING STAGE	OPER'G STAGE	M	CIVIL
ISS	ORIFICE METER DATA SHEET	ORIFICE DATA	J	INSTRUMENT
ISS	ORIFICE PLATE DETAIL	ORIFICE DET	J	INSTRUMENT
KEY	OVERALL PLAN	OVERALL PLAN	A	CIVIL
DOC	PAINTING SPECIFICATION	PAINTING SPEC	H	GENERAL
PNL	PANEL ARRANGEMENT SECTION	PNL ARR'G'T SEC	J	INSTRUMENT
PNL	PANEL DETAIL	PANEL DETAIL	J	INSTRUMENT
PNL	PANEL DIAGRAM	PANEL DIAG	P	ELECTRICAL
SCH	PANEL INTERCONNECTION SCHEDULE	PANEL CONN SCH	P	ELECTRICAL
PNL	PANEL LAYOUT	PANEL LAYOUT	J	INSTRUMENT
SCH	PANEL SCHEDULE	PANEL SCH	P	ELECTRICAL
FDN	PAVEMENT AND SEWER DETAIL	PAV'MT/SEW DET	S	CIVIL
PRS	PERSPECTIVE VIEW	PERSPECT VIEW	A	GENERAL
SDT	PIPE RACK DETAIL	PIPE RACK DET	M	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
FDN	PIPE SLEEPER PLAN	P/SLEEPER PLAN	Q	CIVIL
SDT	PIPE SUPPORT DETAIL	PIPE SUPPT DET	M	CIVIL
PRF	PIPELINE ALIGNMENT	P/L ALIGNMENT	L	MECHANICAL
PPL	PIPELINE ROUTING	P/L ROUTING	L	MECHANICAL
UTI	PIPELINE ROUTING PLAN	P/L ROUTE PLAN	S	MECHANICAL
FLN	PIPELINES ROUTING	P/LINE ROUTING	L	MECHANICAL
PID	PIPING AND INSTRUMENT DIAGRAM	P & I DIAG	A	MECHANICAL
PPL	PIPING ARRANGEMENT	PIPING ARR'G'T	L	MECHANICAL
PPL	PIPING ARRANGEMENT, TERMINAL POINTS	PIPING TERM PT	L	MECHANICAL
PDT	PIPING DETAIL	PIPING DET	L	MECHANICAL
PPL	PIPING INDEX	PIPING INDEX	L	MECHANICAL
PDT	PIPING LAYOUT	PIPING LAYOUT	L	MECHANICAL
PPL	PIPING PLAN	PIPING PLAN	L	MECHANICAL
PDT	PIPING SECTION AND ELEVATION	PIP'G SEC/ELEV	L	MECHANICAL
ARC	PLAN AND DETAIL	PLAN & DET	R	ARCHITECTURE
EQD	PLAN AND DETAILS	PLAN & DETAILS	A	MECHANICAL
ARC	PLAN AND ELEVATION	PLAN & EL	R	ARCHITECTURAL
PRF	PLAN AND PROFILE	PLAN & PROFILE	A	MECHANICAL
ARC	PLAN AND SECTIONS	PLAN & SECT	R	ARCHITECTURAL
ARC	PLAN LAYOUT	PLAN LAYOUT	R	CIVIL
KEY	PLAN OF TELEPHONE MANHOLES	TELE M/H PLAN	T	INSTRUMENT
SDT	PLAN, ELEVATION AND DETAIL	PLAN/ELEV/DET	M	CIVIL
ARC	PLAN, ELEVATIONS AND DETAILS	PLAN/ELEV/DET	R	ARCHITECTURAL
FDN	PLAN, SECTION AND DETAILS	PLAN/SEC & DET	Q	CIVIL
ARC	PLAN, SECTION AND DETAILS	PLAN/SEC & DET	R	ARCHITECTURAL
FDN	PLAN/ELEVATION/SECTION	PLAN/ELEV/SECT	Q	CIVIL
ARC	PLAN/ELEVATION/SECTION	PLAN/ELEV/SECT	R	ARCHITECTURE
SDT	PLAN/SECTION/DETAIL	PLAN/SECT/DET	M	CIVIL
ARC	PLAN/SECTION/ELEVATION AND DETAILS	PLN/SEC/ELE/DET	R	ARCHITECTURE
SDT	PLATES AND ATTACHMENT DETAIL	PLATES DET	M	CIVIL
SDT	PLATFORM ASSEMBLY	P/FORM ASSY	M	CIVIL
SDT	PLATFORM DETAILS	P/FORM DET	M	CIVIL
SSD	PLOT PLAN SSD FENCE	PLOT PLN FENCE	M	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
PLB	PLUMBING DETAIL	PLUMBING DET	S	MECHANICAL
PLB	PLUMBING FLOOR PLAN	PLMB FLR PLAN	S	MECHANICAL
PLB	PLUMBING LAYOUT	PLMB LAYOUT	S	MECHANICAL
PLB	PLUMBING PLAN	PLMB PLAN	S	MECHANICAL
PLB	PLUMBING PLAN, SECTIONS AND DETAILS	PLB, SECT & DET	S	MECHANICAL
PLB	PLUMBING RISER DIAGRAM	PLMB RISE DIAG	S	MECHANICAL
UTI	POND DETAIL	POND DETAIL	S	GENERAL
FPS	PORTABLE SAFETY EQUIPMENT	PORT SAF EQUIP	B	MECHANICAL
CBL	POWER AND CONTROL CABLE	PWR/CONT CABLE	P	ELECTRICAL
EPD	POWER AND GROUNDING LAYOUT	PWR & GNDG L/O	P	ELECTRICAL
EPD	POWER DISTRIBUTION DIAGRAM	PWR DISTR DIAG	P	ELECTRICAL
EPD	POWER LAYOUT	POWER L/O	P	ELECTRICAL
LTG	POWER LIGHTING	PWR LIGHTING	P	ELECTRICAL
SCM	PRINCIPAL DIAGRAM	PRINCIPAL DIAG	A	GENERAL
PFD	PROCESS FLOW DIAGRAM	P. FLOW DIAG	A	GENERAL
SCH	PROCESS INTERFACE SCHEDULE	INTERFACH SCH	A	GENERAL
CBL	RACEWAY PLAN	RACEWAY PLAN	P	ELECTRICAL
RAK	RACK LAYOUT	RACK LAYOUT	M	CIVIL
SDT	RADIATION FENCE	RADIAT'N FENCE	M	CIVIL
RPF	RADIATION PROFILE	RAD PROFILE	T	INSTRUMENT
RPF	RADIO PATH PROFILE	RADIO PATH	T	INSTRUMENT
STL	REBAR SCHEDULE	REBAR SCH	Q	CIVIL
ARC	REFLECTED CEILING PLAN	REFL CEILING PL	R	ARCHITECTURE
STL	REINFORCEMENT DETAILS	REINF DETAIL	Q	CIVIL
STL	REINFORCING BAR SCHEDULE	REINF BAR SCH	Q	CIVIL
SCH	RELAY SETTING SCHEDULE	RELAY SET SCH	P	ELECTRICAL
SCM	RISER DIAGRAMS	RISER DIAG	A	GENERAL
GAP	ROADS AND PAVING	ROADS & PAVING	S	CIVIL
ARC	ROOF DETAILS	ROOF DETAIL	R	ARCHITECTURAL
SDT	ROOF FRAMING	ROOF FRAMING	M	CIVIL
ARC	ROOF FRAMING ELEVATION	RF FRAM'G ELEV	Q	ARCHITECTURE
ARC	ROOF FRAMING PLAN	RF FRAM'G PLAN	Q	ARCHITECTURE
ARC	ROOF PLAN	ROOF PLAN	R	ARCHITECTURE

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
EPD	ROUTING OF DUCT BANK CONDUIT	ROUT'G DUCT	P	ELECTRICAL
EWD	RTD SIGNAL WIRING	RTD SIG WIRING	J	INSTRUMENT
SSD	SAFETY & SECURITY FENCE DIRECTIVES	SSD FENCE	M	CIVIL
SIS	SAFETY INSTRUCTION SHEET	S. I. SHEET	A	INSTRUMENT
SCH	SCHEDULE	SCHEDULE	S	GENERAL
SCH	SCHEDULE OF FINISHES	SCH OF FINISH	R	ARCHITECTURE
SCM	SCHEMATIC DIAGRAM	SCHEM DIAG	A	GENERAL
DOC	SCOPE OF WORK	SCOPE OF WORK	A	GENERAL
ARC	SECTION	SECTION	R	ARCHITECTURE
PLB	SECTIONAL ELEVATION	SECT. ELEV.	S	MECHANICAL
ARC	SECTIONS AND DETAILS	SECT & DET	R	ARCHITECTURAL
ARC	SECTIONS AND ELEVATIONS	SECT & EL	R	ARCHITECTURAL
SDT	SETTING OUT PLAN	SETT'G OUT PLN	M	CIVIL
SCH	SETTLEMENT CHART	SETTLE CHART	A	CIVIL
FDN	SEWER MANHOLE DETAIL	SEWER M/H DET	Q	CIVIL
FDN	SEWER MANHOLE PLAN	SEWER M/H PLAN	Q	CIVIL
FDN	SEWER MANHOLE SECTION	SEWER M/H SEC	Q	CIVIL
ABB	SIGNS	SIGNS	A	GENERAL
GAP	SITE DEVELOPMENT PLAN	SITE DEV PLAN	S	CIVIL
GAP	SITE FURNISHING	SITE FURNISH'G	S	ARCHITECTURE
KEY	SITE PLAN	SITE PLAN	A	GENERAL
ARC	SLAB SECTION AND DETAIL	SLAB SEC/DET	Q	CIVIL
GAP	SOIL INVESTIGATION	SOIL INVESTIG'N	S	CIVIL
EQS	SPECIAL EQUIPMENT	SPECIAL EQUIPME	U	MECHANICAL
UTI	SPRINKLER LAYOUT	L/O SPRINKLER	S	MECHANICAL
SSD	SSD COMPUTER GATE	COMPUTER GATE	M	CIVIL
SSD	SSD DETAIL	SSD DETAIL	M	CIVIL
SSD	SSD FENCE ELEVATION	SSD FENCE ELEV	M	CIVIL
SSD	SSD FENCE PLAN	SSD FENCE PLAN	M	ARCHITECTURE
ARC	STAIR SECTIONS	STAIR SECTION	R	ARCHITECTURE
SDT	STAIRWAY AND DETAIL	STAIRWAY DET	M	ARCHITECTURE
SDT	STAIRWAY AND DETAIL	STAIRWAY DET	M	CIVIL
STL	STEEL BENDING DETAIL	STL BEND'G DET	Q	CIVIL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
FDN	STORM WATER DISCHARGE PIT	STORM DISC PIT	Q	CIVIL
LTG	STREET LIGHTING SYSTEM	STREET LTG SYS	P	ELECTRICAL
SDT	STRUCTURAL DETAIL	STRUCTURE DET	M	CIVIL
ARC	STRUCTURE AND REINFORCEMENT DETAILS	STRUCT./REINF	Q	CIVIL
FLN	SUBMARINE PIPELINE LAYOUT	SUBMARINE P/L	L	MECHANICAL
CBL	SUBSTRUCTURES	SUBSTRUCTURES	P	ELECTRICAL
FSH	SUMMARY SHEET	SUMMARY SHEET	A	GENERAL
DOC	SUMMARY SHEETS	SUMMARY SHEETS	A	GENERAL
FDN	SUMP PIT DETAIL	SUMP PIT DET.	Q	CIVIL
SWG	SWITCHGEAR SPEC. AND ARRANGEMENT	SWGR ARR'G'T	P	ELECTRICAL
EWD	T/C SIGNAL WIRING	T/C SIG WIRING	J	INSTRUMENT
TAB	TABULATION ELECTRICAL LOAD	ELEC LOAD TAB	P	ELECTRICAL
CBL	TELEPHONE CABLES	TELE CABLES	T	INSTRUMENT
CBL	TELEPHONE FACILITY	TELEPHONE FAC.	T	INSTRUMENT
KEY	TELEPHONE FACILITY INDEX	TELE INDEX FAC	T	INSTRUMENT
CBL	TELEPHONE LAYOUT	TELEPHONE L/O	T	INSTRUMENT
TRM	TERMINAL LAYOUT	TERM LAYOUT	P	ELECTRICAL
ISS	THICKNESS GAUGE POINTS	GAUGE PT DET	J	INSTRUMENT
E1L	THREE-LINE DIAGRAM	3-LINE DIAG	P	ELECTRICAL
SCH	TIE-IN INDEX	TIE-IN INDEX	A	MECHANICAL
SCH	TIE-IN SCHEDULE	TIE-IN SCH	A	MECHANICAL
FSH	TITLE SHEET	TITLE SHEET	A	GENERAL
TOP	TOPOGRAPHIC AND CONTOUR MAP	CONTOUR MAP	A	CIVIL
GAP	TRAFFIC ISLAND	TRAFFIC ISLAND	S	CIVIL
ANT	TRANSMISSION LINE LAYOUT	L/O TRANS LINE	P	ELECTRICAL
FDN	TRENCH LAYOUT AND DETAIL	TRENCH LAYOUT	Q	CIVIL
SDT	TRUSS DETAIL	TRUSS DET	M	CIVIL
FPS	TYP. INSTALLATION FIRE FIGHTING SYS	TYP INSTL F/F	B	MECHANICAL
DOC	UOP STANDARD SPECIFICATION	UOP STD SPEC	A	GENERAL
UTI	UTILITY DETAIL	UTILITY DETAIL	S	MECHANICAL
PFD	UTILITY FLOW DIAGRAM	UTIL FLOW DIAG	A	MECHANICAL
UTI	UTILITY LAYOUT	UTILITY LAYOUT	S	MECHANICAL
VOD	VALVE OPERATING DIAGRAM	V.O. DIAG	A	MECHANICAL

Attachment E – Drawing Types and Indexes (Cont'd)

TYPE	DWG TITLE	ABBR. TITLE	INDEX	DISCIPLINE
SCH	VALVE PACKING SCHEDULE	VALVE PACK SCH	A	MECHANICAL
FDN	VALVE PIT DETAIL	VALVE PIT DET	Q	CIVIL
VEN	VENDOR	VENDOR	A	GENERAL
KEY	VICINITY MAP	VICINITY MAP	A	GENERAL
SDT	WALKWAYS	WALKWAYS	M	CIVIL
ARC	WALL AND CEILING OPENING	WALL/CLG OPEN	Q	ARCHITECTURE
ARC	WALL DETAIL	WALL DET.	R	ARCHITECTURE
ARC	WALL SECTIONS	WALL SECTION	R	ARCHITECTURE
ARC	WINDOW AND DOOR DETAILS	W/DOOR DET	R	ARCHITECTURE
EWD	WIRING DIAGRAM	WIRING DIAG	P	ELECTRICAL
SCH	WIRING LIST	WIRING LIST	P	ELECTRICAL
SCH	WIRING SCHEDULE	WIRING SCH	P	ELECTRICAL
IPL	YARD PIPING	YARD PIPING	J	INSTRUMENT
PPL	YARD PIPING	YARD PIPING	L	MECHANICAL

