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ELV System Design Aids

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1.0. PURPOSE

The purpose of this section is to provide the Entity-A/E the templates, checklists, design guidelines, etc. (collectively called Design Aids) to comprehensively define the ELV System design of a Project and ensure that the design is complete, uses appropriate templates and has undergone the necessary checks to achieve the quality design which can be used to purchase fit for purpose material/equipment and safely install all facilities under Entity's project.

Refer to Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the definition of terms used and the instructions on the use of every element of Design Aids. The Section 1 also covers non-discipline specific Design Aid such as Calculation Templates, Calculation check list, Design software list, etc. which apply to all engineering disciplines including ELV System. Users are urged to carefully read the instructions provided in Chapter 7, Section 1 to fully understand the purpose and use of all documents listed in this section.

The Entity-A/E shall review the list of documents in both sections (Section 1 and 7) of Volume 6, Chapter 7 and determine the templates, check lists, etc. applicable to their project. The list of applicable templates/ checklists/ etc. may vary from project to project depending upon the Design Scope of Work of every Project.

2.0 REFERENCE

1. EPM-KE0-GL-000016 - General Design Guidelines
2. EPM-KEE-GL-000002 - ELV System Design Guideline
3. EPM-KE0-GL-000007 : ELV System Integration Guidelines
4. EPM-KE0-GL-000008 : Fire and Life Safety Integration Guideline
5. EPM-KE0-GL-000009 : Building Management System (BMS) and Mechanical System integration Guideline
6. Communications and Information Technology Commission (CITC) Rules shall be followed for ICT requirements. The ICT Rules and requirements can be found on web site www.citc.gov.sa, http://www.citc.gov.sa/en/Decisionsoffers/Decisions/Pages/392-1439.aspx

3.0. ELV SYSTEM DESIGN AIDS

The ELV System Design Aids developed for use on Entity's projects are listed below, each issued as a standalone document.

3.1 . ELV SYSTEM Design Guideline

Refer to 12.1 of Volume 6, Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the purpose and the instructions on the use of discipline Design Guidelines issued for use in the design of Entity's Projects.

Refer to the document **EPM-KEE-GL-000002** for the details of the ELV System Design Guideline

3.2 ELV SYSTEM Design Deliverables

Volume 6, Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the purpose and the instructions on the use of List of Design Deliverables issued for use in the design of Entity's projects.

Refer to the document ELV System Design Guideline EPM-KEE-RG-000002 for a typical list of design deliverables applicable for the ELV design discipline.

3.3 Design Check Lists

Volume 6, Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the purpose and the instructions on the use of Checklists issued for the use in the design of Entity's projects.

The Table below lists ELV System Checklists issued for use on Entity's Projects

List of ELV System - Checklist

SN	Title of the Documents	Document Number
1	Checklist - Distributed Control System (DCS) Block Diagram	EPM-KEE-TP-000009
2	Check List - CCTV Surveillance System Layout	EPM-KEE-TP-000010
3	Check List - ELV System Schematics	EPM-KEE-TP-000011
4	Check List - Structured Cabling System	EPM-KEE-TP-000012
5	Check List - Access Control System Layout	EPM-KEE-TP-000025
6	Check List - Public Address System layout	EPM-KEE-TP-000026
7	Check List - Master Clock System Layout	EPM-KEE-TP-000027
8	Check List - Distributed TV System Layout	EPM-KEE-TP-000028
9	Check List - Audio/Visual System Layout	EPM-KEE-TP-000029
10	Check List - Fire Alarm System Layout	EPM-KEE-TP-000030
11	Check List - Intercom System Layout	EPM-KEE-TP-000031

3.4 Templates

Volume 6, Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the purpose and the instructions on the use of Templates issued for the use in the design of Entity's projects.

Table below lists ELV System templates issued for use on Entity's Projects

List of ELV System - Templates

SN	Title of the Documents	Document Number
1	Template - ELV Design Criteria	EPM-KEE-TP-000022

3.5 Typical Construction Detail Drawings (TCDDs)

Volume 6,Chapter 7, Section 1 - General Design Guidelines (Document No EPM-KE0-GL-000016) for the purpose of issue of TCDD in the design of Entity's projects.

Table below lists examples of ELV System TCDD's issued as sample for use by Entity.

SN	Title of Drawing	Discipline	Document Number
1	Typical Fire Alarm Riser Diagram	ELV	EPM-KEE-05-000006
2	Access Control Door Details	ELV	EPM-KEE-05-000007
3	Telecommunication and Audio Visual outlet mounting Details	ELV	EPM-KEE-05-000008
4	Surveillance camera Details	ELV	EPM-KEE-05-000009
5	IP camera Details	ELV	EPM-KEE-05-000010

4.0 ATTACHMENT

1. EPM-KEE-TP-000011 - Checklist - ELV System Schematics
2. EPM-KEE-TP-000009 - Checklist - Distributed Control System (DCS) Block Diagram
3. EPM-KEE-TP-000010 - Checklist - CCTV / Surveillance System Layout
4. EPM-KEE-TP-000012 - Checklist - Structured Cabling System Layout
5. EPM-KEE-TP-000025 - Checklist - Access Control System Layout
6. EPM-KEE-TP-000026 - Checklist - Public Address System Layout
7. EPM-KEE-TP-000027 - Checklist - Master Clock System Layout
8. EPM-KEE-TP-000028 - Checklist - Distributed TV System Layout
9. EPM-KEE-TP-000029 - Checklist - Audio/Visual System Layout
10. EPM-KEE-TP-000030 - Checklist - Fire Alarm System Layout
11. EPM-KEE-TP-000031 - Checklist - Intercom System Layout
12. EPM-KEE-TP-000022 - Template - ELV System - Design Criteria
13. EPM-KEE-RG-000002 - List of ELV Design Deliverables
14. EPM-KEE-05-000006 - Typical Fire Alarm Riser Diagram
15. EPM-KEE-05-000007 - Access Control Door Details
16. EPM-KEE-05-000008 - Telecommunication and Audio Visual Outlets mounting details
17. EPM-KEE-05-000010 - IP Camera Details
18. EPM-KEE-05-000009 - Surveillance Camera Details

Attachment 1 - EPM-KEE-TP-000011 - Checklist - ELV System Schematics

PROJECT NAME:		DRAWING NO.			REV.		
No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does ELV System Schematic comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
3	Do the drawing notes complete & agree with information on the drawings & details?	☐	☐	☐	☐	☐	☐
4	Are the layout legends specific and provide the details?	☐	☐	☐	☐	☐	☐
5	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
6	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
7	Does ELV System Schematic prepared in accordance to the applicable Code, International and Saudi standard, local Government Regulation, the suppliers or vendors requirements and Project Specification?	☐	☐	☐	☐	☐	☐
8	Verify the equipment and components tag identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
C. Reference Information							
9	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
10	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
11	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.).	☐	☐	☐	☐	☐	☐
D. Design							
12	Does ELV System Schematic prepared in a ladder format?	☐	☐	☐	☐	☐	☐
13	Does ELV System Schematic provide the adequate information regarding interconnection details between devices, devices to the equipment's (main panels), communicate or integrate with the other ELV System?	☐	☐	☐	☐	☐	☐
14	Does ELV System Schematic provide the details of the cables (Both the system and communication cable)?	☐	☐	☐	☐	☐	☐
15	Does ELV System Schematic prepared, based on the function of Control System Logic?	☐	☐	☐	☐	☐	☐
16	Does ELV System Schematic looping arrangement complete and function?	☐	☐	☐	☐	☐	☐
17	Does ELV System Schematic prepared in accordance with the manufacturer standards and product information?	☐	☐	☐	☐	☐	☐
18	Does the selection and the location of peripheral devices, components, etc.as per the specialist recommendation and the project requirements?	☐	☐	☐	☐	☐	☐
19	Does ELV System Schematic show the device termination details?	☐	☐	☐	☐	☐	☐
20	Does ELV System Schematic provide the details of interfaces, I/O addresses, functional diagram?	☐	☐	☐	☐	☐	☐
21	Does ELV System Schematic provide the details of spare and future provision?	☐	☐	☐	☐	☐	☐

Attachment 2 - EPM-KEE-TP-000009 - Checklist - Distributed Control System (DCS) Block Diagram

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does ELV Block Diagram comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the ELV Block Diagram reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
4	Are note on ELV Block Diagram complete & agree with information on the drawings & details?	☐	☐	☐	☐	☐	☐
5	Are ELV Block Diagram legends specific and provide the details regarding the type of the cable (both Fire cables and communication cables), and the detail of devices, interface with MEP services includes ELV and the security & control system, etc.?	☐	☐	☐	☐	☐	☐
6	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
7	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
8	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
9	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
C. Reference Information							
10	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
11	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
12	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
D. Design							
13	Ensure, the control system block diagram depict the Architecture of the plants control system and interface among the system required for overall operation of process plant.	☐	☐	☐	☐	☐	☐
14	Does the block diagram provide the adequate information regarding interconnection details between devices (includes the instruments, Junction Boxes, Marshall Cabinet, ant etc.)?	☐	☐	☐	☐	☐	☐
15	Does the block diagram provide the details of overall connection of the system?	☐	☐	☐	☐	☐	☐
16	Does the block diagram provide the comprehensive information of the cable (such as type, model, number of pairs/cores, etc.)?	☐	☐	☐	☐	☐	☐
17	Does the block diagram provide the details of backbone (riser) diagrams?	☐	☐	☐	☐	☐	☐
18	Does the block diagram specify and provide the details of the equipment/ panels location (such as main locations, remote I/O locations, indoor/outdoor location, control room/building limit)?	☐	☐	☐	☐	☐	☐

Attachment 3 - EPM-KEE-TP-000010 - Checklist - CCTV / Surveillance System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable, the detail of the IP Camera and accessories, Server, routers, switches, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Notes and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
15	The installation of the system shall be in accordance with NFPA, EIA/TIA, NEC, NEMA, BICSI and other applicable standards.	☐	☐	☐	☐	☐	☐
16	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable code.	☐	☐	☐	☐	☐	☐
17	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
C. Reference Information							
18	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
19	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
20	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
21	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐
22	Sections and details are correctly cross-referenced.	☐	☐	☐	☐	☐	☐

Attachment 4 - EPM-KEE-TP-000012 - Checklist - Structured Cabling System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does the drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Have the layout prepared with the latest Architectural Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete and agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, the containment route, etc.) clearly defined and coordinated with the other services?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific or provide the details regarding the type of the cables (Both the horizontal and vertical), mounting height of the voice and data outlets, rack and patch panel, patch cord, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	Have the interdisciplinary comments and comments from previous revision been resolved and incorporated. Holds and revisions are correctly marked?	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified. (Not applicable for power projects).	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation, Project Specification, and meets the local service provider requirements	☐	☐	☐	☐	☐	☐
15	The type/size of cables meets applicable code(IEEE/EIA/TIA), standard and project specification.	☐	☐	☐	☐	☐	☐
16	Ensure the availability of the standard installation details of voice/data outlets, patch panel and patch cord, cable management rack and termination details of copper cables and Fiber Optic cables.	☐	☐	☐	☐	☐	☐
17	Verify the cable and equipment tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
C. Reference Information							
18	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
19	List and verify any special requirements by others (Sub-Contractors/specialist, Vendors, etc.)	☐	☐	☐	☐	☐	☐
20	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
21	Sections and details are correctly cross-referenced.	☐	☐	☐	☐	☐	☐
D. Design							
22	Have the Structured Cabling System design and selection which includes the cables (both horizontal and vertical, indoor and outdoor),	☐	☐	☐	☐	☐	☐

Attachment 5 - EPM-KEE-TP-000025 - Checklist - Access Control System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout prepared with the latest Architectural Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete and agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific or provide the details regarding the type of the cables (Both the horizontal and vertical), mounting height of the voice and data outlets, rack and patch panel, patch card, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
14	The type/size of wiring meets applicable code/standard and project specification.	☐	☐	☐	☐	☐	☐
15	Do the devices, components and the control panels as per NEMA standard and UL Listed?	☐	☐	☐	☐	☐	☐
16	Does the layout provide the installation detail of the controller, reader, locking devices, door position switch, request to exit (Push button), the power supply requirement, etc.?	☐	☐	☐	☐	☐	☐
17	Are identification and labelling provided as per codes and standards?	☐	☐	☐	☐	☐	☐
C. Reference Information							
18	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
19	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
20	Sections and details are correctly cross-referenced.	☐	☐	☐	☐	☐	☐
D. Design							
21	Have the designing of Access Control System and the layout compatible with the existing advance new technology and meet the project requirement?	☐	☐	☐	☐	☐	☐
22	Have the layout coordinated with the Architectural/Structural Layout, Electrical and Mechanical System?	☐	☐	☐	☐	☐	☐
23	Do the system and layout cover entire building premises and protect the unauthorized access?	☐	☐	☐	☐	☐	☐
24	Do the system zone configuration as per the building life safety plan? (Ensure the zonal configurations are not as per the software program).	☐	☐	☐	☐	☐	☐

Attachment 6 - EPM-KEE-TP-000026 - Checklist - Public Address System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A.	**Drawing Presentation**						
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout prepared with the latest Architectural Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, amplifier and rack, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable, and the detail of the devices, components, amplifier rack, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B.	**Code/Standard/Project Specification**						
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
15	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
16	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
17	Are the layouts provided with Mounting Dimension of the Loud Speaker, Racks, Panels, Associated Equipment's and devices, etc.?	☐	☐	☐	☐	☐	☐
18	The designing of the Public Address System shall be in compliance with the design criteria.	☐	☐	☐	☐	☐	☐
C.	**Reference Information**						
19	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
20	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
21	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
22	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐
23	Ensure the amplifier loading are not exceeded 80% of the amplifier power rating.	☐	☐	☐	☐	☐	☐

Attachment 7 - EPM-KEE-TP-000027 - Checklist - Master Clock System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A.	**Drawing Presentation**						
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable, and the detail of the devices, components GPS Receiver, Transmitter and the equipment mounting in rack, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Clouds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B.	**Code/Standard/Project Specification**						
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
15	The installation of the system shall be in accordance with NFPA, EIA/TIA, NEC, NEMA, BICSI and other applicable standards.	☐	☐	☐	☐	☐	☐
16	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable code.	☐	☐	☐	☐	☐	☐
17	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
C.	**Reference Information**						
18	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
19	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
20	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
21	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐
22	Sections and details are correctly cross-referenced.	☐	☐	☐	☐	☐	☐
23	Have the layout specified the dedicated containment for Public Address System?	☐	☐	☐	☐	☐	☐
24	Does the layout provide the detail of the containment route (both the horizontal and vertical)?	☐	☐	☐	☐	☐	☐

Attachment 8 - EPM-KEE-TP-000028 - Checklist - Distributed TV System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A.	**Drawing Presentation**						
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. is legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Does the Distribution Television System layout describe type of the system (IPTV, Hybrid Fiber Coaxial and Satellite Master Antenna Television) implemented for the project?	☐	☐	☐	☐	☐	☐
10	Are the layout legends specific and provide the details regarding the type of the cable (Coaxial, UTP/STP and Fiber), the devices, components, splitter, core switch, antenna, etc.?	☐	☐	☐	☐	☐	☐
11	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
12	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
13	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
14	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B.	**Code/Standard/Project Specification**						
15	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
16	The installation of the system shall be in accordance with NFPA, EIA/TIA, NEC, NEMA, BICSI, ETSI and other applicable standards.	☐	☐	☐	☐	☐	☐
17	Verify the equipment and components tag/identification numbers, dimensions, locations, etc., with project standards/vendor documents, as applicable code.	☐	☐	☐	☐	☐	☐
18	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
C.	**Reference Information**						
19	Check to ensure general notes include references to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
20	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
21	List and verify any special requirements by others (Subcontractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
22	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐
23	Sections and details are correctly cross-referenced.	☐	☐	☐	☐	☐	☐

Attachment 9 - EPM-KEE-TP-000029 - Checklist - Audio/Visual System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A.	**Drawing Presentation**						
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. is legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable, and the detail of the devices, components, equipment's, rack, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B.	**Code/Standard/Project Specification**						
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
15	The installation of the system shall be in accordance with NFPA, EIA/TIA, NEC, NEMA, BICSI, ETSI and other applicable standards.	☐	☐	☐	☐	☐	☐
16	Selection of the Equipment's and components shall be UL Listed.	☐	☐	☐	☐	☐	☐
17	Verify the equipment and components tag/identification numbers, dimensions, locations, etc., with project standards/vendor documents, as applicable code.	☐	☐	☐	☐	☐	☐
18	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
19	The designing of the Audio Visual System comply with the design criteria.	☐	☐	☐	☐	☐	☐
C.	**Reference Information**						
20	Check to ensure general notes include references to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
21	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
22	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
23	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐

Attachment 10 - EPM-KEE-TP-000030 - Checklist - Fire Alarm System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does the drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. are legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical (both LV System & ELV System) and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable (both Fire cables and communication cables), and the detail of FACP, devices, interface with MEP services includes ELV and the security & control system, Interface with Elevator, etc.?	☐	☐	☐	☐	☐	☐
10	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
11	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
12	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
13	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
14	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
15	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
16	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
17	The installation of the system shall be in accordance with NFPA 70, NFPA 72, NFPA 90, NFPA101, NEC, NEMA, ASMI/ANSI A17.1 (Elevator Safety) and other applicable standards.	☐	☐	☐	☐	☐	☐
18	The designing of the Fire Alarm System shall comply with the design criteria.	☐	☐	☐	☐	☐	☐
C. Reference Information							
19	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
20	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
21	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐

Attachment 11 - EPM-KEE-TP-000031 - Checklist - Intercom System Layout

PROJECT NAME:	DRAWING NO.	REV.

No.	QUESTIONS	ORIGINATOR			CHECKER		
		N/A	YES	NO	N/A	YES	NO
A. Drawing Presentation							
1	Does Drawing comply with the project CAD Standards (All lines, symbols, legends, abbreviations, text, etc. is legible)?	☐	☐	☐	☐	☐	☐
2	Is the Drawing reviewed for constructability?	☐	☐	☐	☐	☐	☐
3	Is the layout read and interpreted in conjunction with the applicable Architectural, Civil, Electrical and Mechanical Layout?	☐	☐	☐	☐	☐	☐
4	Are the fields in the title block consistent with the project drawing log/ index?	☐	☐	☐	☐	☐	☐
5	Key plan and North arrow are provided & the key plan shall have the layout area hatched.	☐	☐	☐	☐	☐	☐
6	Match lines or X-Y Grid are clearly defined.	☐	☐	☐	☐	☐	☐
7	Drawing notes are complete & agree with information on the drawings & details.	☐	☐	☐	☐	☐	☐
8	Are the layout dimensions (mounting height, operating height of the outlets, devices, etc.) clearly defined?	☐	☐	☐	☐	☐	☐
9	Are the layout legends specific and provide the details regarding the type of the cable, and the detail of the devices, components, etc.?	☐	☐	☐	☐	☐	☐
10	Bar scale is shown on the drawing and correct scale is used for all details, plan/elevation/sections. Details Not to Scale are also clearly marked.	☐	☐	☐	☐	☐	☐
11	All interdisciplinary comments and comments from previous revisions have been resolved and incorporated. Holds and revisions are correctly marked.	☐	☐	☐	☐	☐	☐
12	Limits of existing and new work including future expansions, interface points, Battery limits are clearly defined.	☐	☐	☐	☐	☐	☐
13	Check if conduit continuations between drawings have been verified and properly identified.	☐	☐	☐	☐	☐	☐
B. Code/Standard/Project Specification							
14	The system design shall comply with the applicable Code, International and Saudi standard, local Government Regulation and Project Specification.	☐	☐	☐	☐	☐	☐
15	The installation of the system shall be in accordance with NFPA, EIA/TIA, NEC, NEMA, BICSI, ETSI and other applicable standards.	☐	☐	☐	☐	☐	☐
16	Verify the equipment and components tag/identification numbers, dimensions, locations, etc. with project standards/vendor documents, as applicable.	☐	☐	☐	☐	☐	☐
17	Make sure that each type of connection/installation is represented either by standard details applicable for the project or details are drawn on the layout drawing.	☐	☐	☐	☐	☐	☐
18	Selection of the Equipment's and components shall be complied to UL List.	☐	☐	☐	☐	☐	☐
19	The designing of the Intercom System shall comply with the design criteria.	☐	☐	☐	☐	☐	☐
C. Reference Information							
20	Check to ensure general notes include reference to applicable Codes, Standards and Project Specifications/Supplier submittals.	☐	☐	☐	☐	☐	☐
21	Check for correctness of reference drawings.	☐	☐	☐	☐	☐	☐
22	List and verify any special requirements by others (Sub-Contractors, Vendors, etc.)	☐	☐	☐	☐	☐	☐
23	Are the layout provided the details of the wiring diagram?	☐	☐	☐	☐	☐	☐

Attachment 12 - EPM-KEE-TP-000022 - Template - ELV System - Design Criteria

EXPRO

TEMPLATE - ELV SYSTEM - DESIGN CRITERIA

9.0 TELECOMMUNICATION SYSTEM

Describe briefly the requirements of the following Communication systems based on the Scope of Work

9.1 Voice/Data Communication System

Describe the horizontal Building Cabling System which Interconnection with Backbone network i.e., Fiber – Optics Cable – Service Provider a stated below:

- *Implementation of the horizontal building cabling system for voice/data communications in the building.*
- *Shall interconnect with fiber-optic to core network from Saudi Telecom Company (STC) campus backbone network.*
- *The design drawing shows the layout of PDS components for voice, data and television that shall allow connectivity of the workstations to the structured cabling.*
- *The fiber optic cable network shall implement for this project primarily based on Fast Ethernet application.*
- *The structured cabling system and LAN electronic components function together to create a working of voice and data transport structure.*
- *Local-area network (LAN) switches are at the core of all networks, providing high-speed connectivity among users, applications, and communications systems.*
- *The network router is quickly evolving from a device dedicated to connecting disparate networks to an integrated service device capable of multiple functions beyond routing.*
- *Voice Gateways shall consider:*
    - *Analog and digital voice call support*
    - *Optional Voice mail support*
    - *No. of IP phone in one loop*
    - *the operation of the router (provide call-processing functionality to keep voice service in operation)*

9.2 IP Telephone and Intercom System

- ***IP Telephone**: Selection Criteria shall describe and design the system based on IP based. IP telephony multi – service network shall be provided on the voice, video and data shall coexist in the single IP based infrastructure.*
- ***Intercom System:** Selection Criteria shall describe the type of the system based on the various facility. The intercom system design criteria shall consider or utilize the building IP network communication.*

9.3 Master Antenna Television System

Selection Criteria shall describe the type & size of cables, the cable route up to the outlets, roof Master antenna (type of antenna), TV Gateway, amplifier, DVD Player and other accessories, convertor, splitters, tap-offs, required minimum signal level, signal noise ratio, etc.

9.4 IPTV system

Selection Criteria shall describe and design the system by utilizing FTTH GPON for distribution by ensuring the main headend building location and each IPTV Building are connected to the headend building location

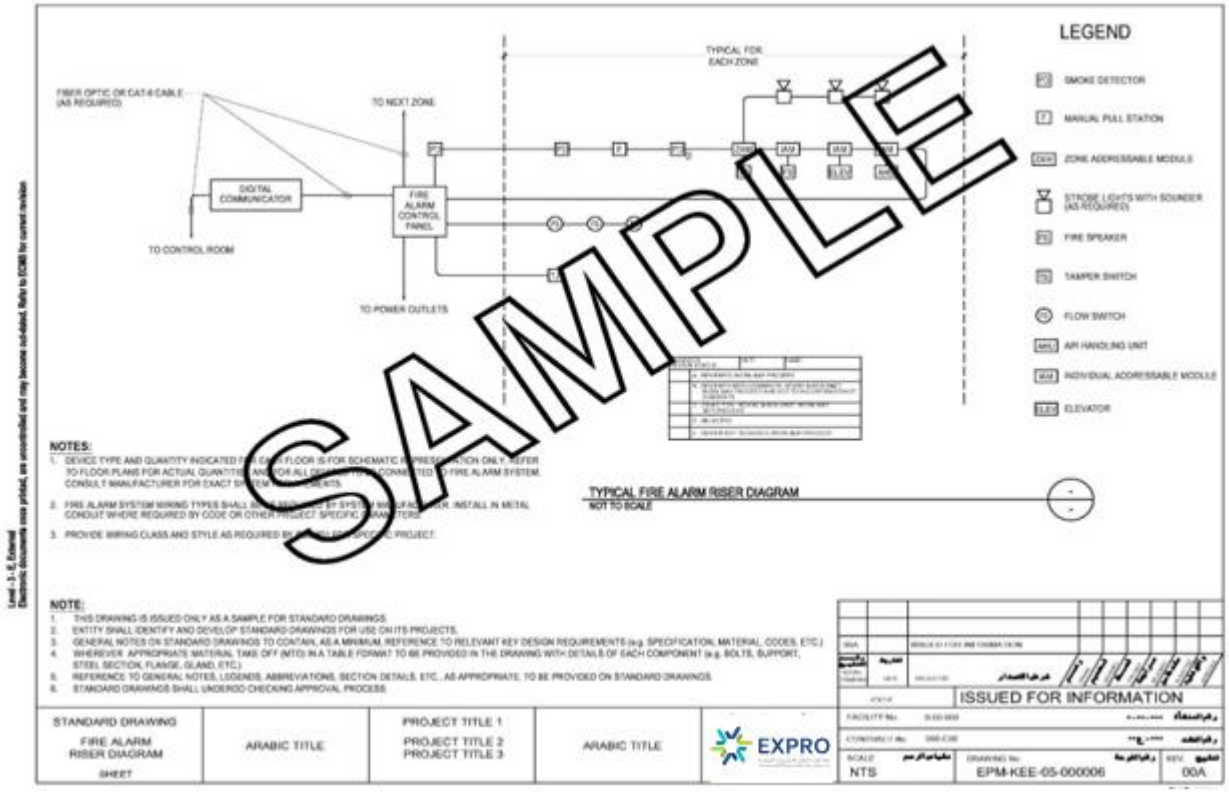
9.5 Public Address System

Selection Criteria shall describe and design the system such as location of the main control panel and devices for transmission of general announcements, emergency alarms and music and praying announcement. A remote microphone shall be used for emergency broadcast and will be located at the main reception desk. Emergency broadcast shall have priority over another broadcast. The system shall

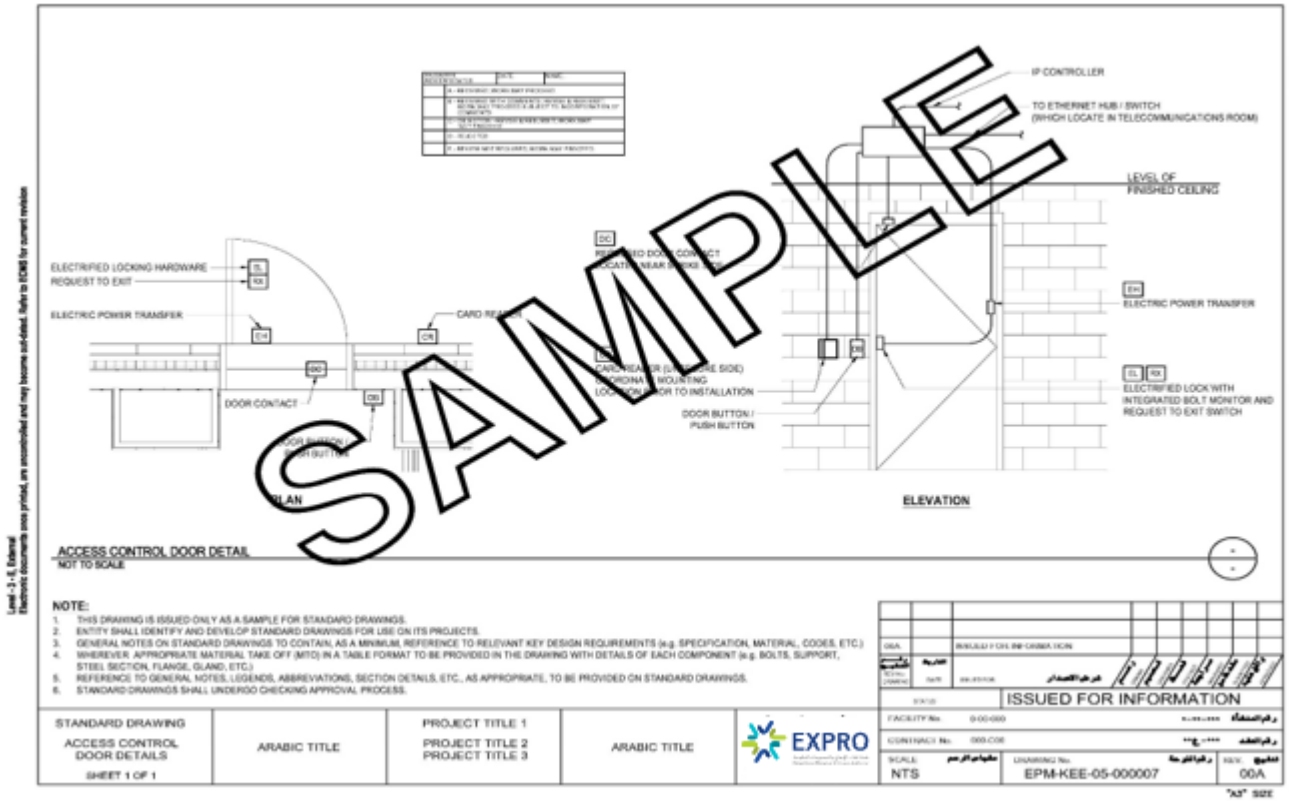
Attachment 13 - EPM-KEE-RG-000002 - List of ELV Design Deliverables

S. No.	Deliverables	Tool	Deliverables Contents	Deliverables Data					Comments
				Developed During	Procurement	Construction	Start-up & Commissioning	Project Controls	
1	3D Model	3D modelling and Software	The 3D model shall show realistic depictions and contain relevant design data for all physical disciplines in sufficient detail as per the project 3D CAD procedures	B		Y	Y		Refer to Project Design Criteria for the requirement of 3D modelling and software to be used
2	Material Assignment Schedule (MAS) and Contract Assignment Schedule (CAS)	MS EXCEL	Developed by Contracts group with Engineering input	B & D	Y			Y	
3	Construction Facilities / Site Coordinating Plan	2D	Shows the location and type of required facilities, including lay down areas, trailer locations, fabrication areas, and temporary warehouses.	B & D		Y			Project to determine if this is done by Engineering or Construction.
4	Permitting submittals	PDF	Includes documents and drawings required for applicable construction and environmental permitting activities for the project	B		Y			Refer to project permitting requirements.
5	Design Basis / Design Criteria Document	MS Word	Refer Document Reference Number EPM-KEE-TP-000022 for the contents of Design Criteria	B					
6	Scope of Work/ Specifications	MS Word	Refer to templates Document Number: EPM-KEO-PR-000006 and EPM-KEO-TP-000009 respectively for SOW and Specification	B&D	Y	Y	Y		
7	Data Sheet(s)	MS Word / MS Excel	Engineered component data sheets which are generated to include all functional requirements for the inclusion within subcontract packages.	D		Y	Y		
8	Bulk Quantity Takeoff / BOQ	MS Word / MS Excel	Bulk Quantity Takeoffs (QTOs) for tracking engineering-released quantities at 30%, 60%, & 90%	B & D	Y	Y	Y	Y	

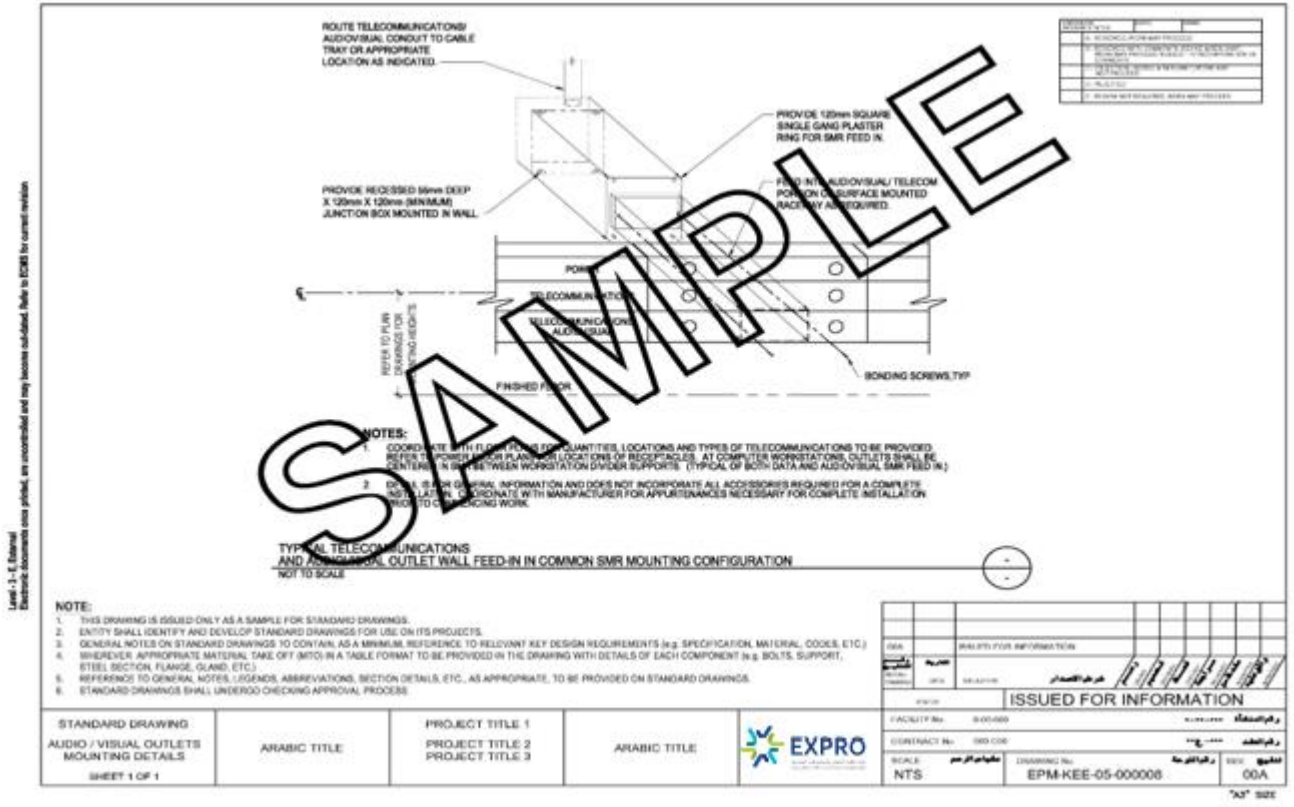
Attachment 14 - EPM-KEE-05-000006 - Typical Fire Alarm Riser Diagram



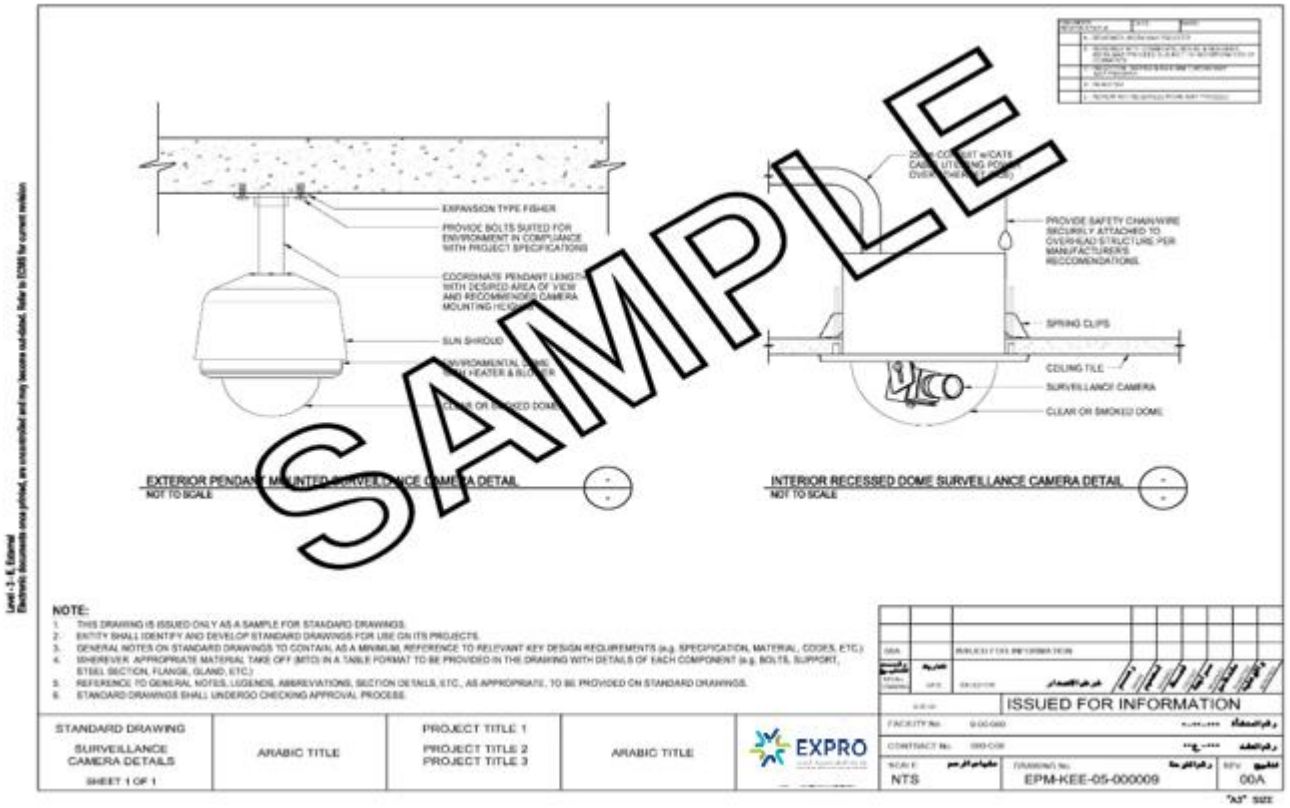
Attachment 15 - EPM-KEE-05-000007 - Access Control Door Details



Attachment 16 - EPM-KEE-05-000008 - Telecommunication and Audio Visual Outlets Mounting Details



Attachment 17 - EPM-KEE-05-000009 - Surveillance Camera Details



Attachment 18 - EPM-KEE-05-000010 - IP Camera Details