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Project Construction Electrical Works Procedure

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1.0 PURPOSE

This procedure identifies the minimum controls, timing of exchange, and responsible parties necessary to ensure the quality and documentation requirements for the work operations associated with Electrical Construction Works.

This procedure applies to works performed under all Government construction projects executed throughout the Kingdom of Saudi Arabia.

For the purposes of the Construction Management Procedures the Project Management Company is the Entity Project Management Organization (EPMO) appointed by the Entity and references prefixed with "Site", such as Site Construction Department, Site Engineering Department, represent the Project Management Company at Project level, on construction sites.

2.0 SCOPE

This procedure applies to receiving, handling and installing materials and equipment including Medium Voltage/Low Voltage (MV/LV) switchgear, transformers, LV (Low Voltage) breakers, panel boards, motor controllers, Uninterruptible Power Supply (UPS), batteries, battery chargers and all other electrical equipment as described in the contract for Electrical Works.

This procedure includes various elements of electrical construction works, including:

1. Cable Tray and covers / Conduit Installation
2. Cable Installation and Terminations
3. Electrical Equipment Installation
4. Building Services (includes Heating Ventilation and Air-Conditioning (HVAC) Controls, Lighting, Access Control, Security, Closed Circuit Television (CCTV), Fire Protection, etc.)
5. Installation of Fiber Optics
6. Underground Ductbanks

Construction Contractor shall develop procedures to cover as a minimum the following:

1. Electrical Equipment Installation
2. Raceways & Accessories
3. Cable Installation and Terminations
4. Access Control
5. Fire Protection
6. Security
7. Lighting
8. Fiber Optic Installation
9. Grounding
10. Construction Electrical Testing

3.0 DEFINITIONS

Definitions	Description
Architect/Engineer (A/E) Consultant	Architectural/Engineer Consultant appointed by the EPMO to undertake the design of the project.
Change Request	A 2nd Party-initiated request for an Entity Change Notice due to some differing site conditions, constructive change, or similar event justifying issuance of a Change Notice. A contractual notice advising the Contractor of a potential compensable change.
Design Change Notice (DCN)	A set of technical documents intended to be either added to a conformed contract or to replace specified parts of a conformed contract. All DCNs are initiated by the Project Management Company Engineering Department and

Definitions	Description
	executed by a Design Contractor, referred to as Architect/Engineer A/E.
Entity Project Management Organization (EPMO)	An Entity Project Management Organization, this is an integrated team that comprises the Entity and its PMC responsible for managing all the Entity's projects.
Field Change Document (FCD)	A document used to make a change to an issued design document at site. Once approved, it is a valid design document.
Issued for Construction (IFC)	Engineering document that is ready to be constructed.
Non-Conforming Item (Non-Conformity Report, NCR)	A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate.
Technical Query (TQ)	A document used to request formal clarification of contract documents, design documents, or design intentions. A TQ may not be used to change design, schedule, or cost.
Construction Contractor	The Main or Principal Contractor responsible for undertaking the Construction Works on the Project. Individual(s) or firm(s) engaged in the construction of buildings, either residences or commercial structures, as well as construction activities such as paving, highway construction, utility construction and landscape installation.
Site Contracts Department	Department within the Project Management Company that is responsible for administering Contracts.
Site Construction Department	Department within the Project Management Company that is responsible for Construction activities/ operations
Site Engineering Department	Department within the Project management Company that is responsible for Engineering or design activities / operations
Enterprise Content Management System (ECMS)	An information management and collaboration platform for managing and controlling program documents and records.
Material Assignment Schedule	A list of approved permanent plant, equipment, materials and services for use on the Project. The Site Engineering Department are usually tasked with the production of this list from the design documentation, specifications and drawings. The Construction Contractor may wish to submit alternative materials for approval or add to the list of approved materials where necessary.
Job Hazard Analysis (JHA)	The identification of all tasks that contain installation steps which may pose a hazard risk to personnel.

4.0 REFERENCES

1. EPM-KCQ-PR-000005: Project Construction Quality Management System Procedure
2. EPM-KCE-PR-000007: Project Construction As-Built Drawings Procedure
3. EPM-KCC-PR-000002: Project Construction Field Work Activities Procedure
4. EPM-KCC-PR-000003: Project Construction Completions and Turnover Procedure

5.0 RESPONSIBILITIES

5.1 Construction Contractor

The Construction Contractor is responsible for planning and executing the Electrical Works in accordance with the contract requirement and specifications

5.2 Site Construction Department

The Construction Department shall be responsible for coordinating all site-based construction support and lead the management of the Construction Contractor.

6.0 PROCESS

6.1 General

The Construction Contractor shall plan and execute the works in accordance with EPM-KCC-PR-000002 Project Construction Field Work Activities Procedure.

6.2 Electrical Installations

The Construction Contractor shall prepare a Construction Electrical Work Plan which will describe the methods of installation for the Construction Electrical Works and will also provide a tracking tool for the identification of components and installation progress of the electrical work.

The Construction Contractor shall undertake the installation of electrical tray, conduit (above ground and underground duct banks), cable (including Fibre), equipment, building services equipment, and materials in accordance with the contract requirements, specifications and drawings and accepted shop drawings.

The Construction Contractor shall procure, if required by the contract, the necessary material and electrical equipment to meet the project requirements. In general, the fabricator will prepare shop drawings for submission and acceptance by the Site Construction or Site Engineering Departments.

The Construction Contractor shall establish a System and Equipment Safety Lockout / Tagout procedure to control the connection of electrical circuits to hazardous energy.

The Construction Contractor shall prepare a Working On or Near Electrical Circuit procedure to provide the safety requirements for energized equipment.

As per contract and project specifications, equipment, cables and devices shall be tested to verify that the electrical control, protection and circuits function in accordance with design requirements.

The Construction Contractor shall prepare a set of as-built drawings and field sketches in accordance with project requirements.

The Construction Contractor shall provide all Operations and Maintenance Manuals, procure spare parts, and undertake relevant training to be provided to the Entity as required under the contract requirements and EPM-KCC-PR-000003 Project Construction Completions and Turnover Procedure.

6.3 Electrical Equipment

6.3.1 General

The design drawings and the project specifications indicates the equipment that will be installed in the Electrical Works.

The types of drawings utilized when installing electrical equipment are:

1. Plan Drawings. (Issued for Construction-IFC)
2. Standard Notes and Details Drawings.
3. Wiring Diagrams.
4. Single Lines Drawings.
5. Schematics.
6. Vendor Drawings.
7. Vendor Manuals and Instructions.
8. Area Classification Drawings.

6.3.2 Materials

All equipment and associated materials shall meet the requirements of the project specifications, design drawings, and local, regional and national codes unless otherwise noted in the contract.

Electrical and instrumentation equipment purchases are identified and detailed in the project specifications and drawings. The procurement of materials will be in accordance with the Material Assignment Schedule (MAS). The Site Engineering Department coordinates the procurement of the equipment with the Construction Contractors Purchasing Department.

Upon receipt of the electrical equipment and materials, the Construction Contractor shall inspect the electrical equipment to confirm that the equipment and equipment internals are free of physical damage, and shall verify that the equipment and materials complies with the Specifications and Drawings.

The Construction Contractor shall check shock impact recorders if provided and shall confirm the receipt of items shipped loose.

The Construction Contractor shall organize, control, and maintain the storage of the materials and equipment until completion and turnover. Electrical equipment shall be stored as per manufacturer recommendations.

6.3.3 Pre-Planning

The Construction Contractor shall monitor the delivery of long lead items and unless stated otherwise in the contract, the Construction Contractor shall order any specialty tools or provide equipment specialists needed to complete the installation.

The Construction Contractor shall resolve any design conflicts through the Site Engineering Department.

The Construction Contractor shall schedule equipment installation activities and include the identify of other discipline commodities that must be installed to support raceway, equipment, other building services installation and cable-pulling activities to ensure that the project schedule is met.

The Construction Contractor shall determine any special rigging requirements for large equipment and shall develop a detailed heavy lift rigging plan or critical lift plan as required.

The Construction Contractor, shall review with the installation craft or subcontractor, the installation requirements of a completed equipment installation. This review is required to familiarize the craft or subcontractor with the installation sequence of the equipment.

6.3.4 Work Preparation and Execution

All conduit stub-ups, grounding and embedded plates must be installed per the design drawings to accommodate equipment installation.

For layout and preparation, templates should be utilized wherever possible to ensure proper installation.
The Construction Contractor shall ensure that necessary flagging and barricades are used to keep personnel who are not directly involved with the work activity away from the work area.

The Construction Contractor shall arrange for all tools and equipment required to complete the work such as hand jacks, slings, hoists, lifting devices, welding machines, cranes, man-lifts, and pickers. The Construction Contractor shall organize fabrication areas and material storage laydown areas as assigned.

The Construction Contractor along with the concurrence of the Site Construction Department should review electrical equipment installation requirements for any special installation requirements and determine if a specialty subcontractor should perform the work.

The Construction Contractor shall inspect each piece of equipment prior to setting to confirm that the equipment is the proper size, type, and rating and is properly tagged.

The Construction Contractor shall arrange for all safety and work permits, design drawings, vendor drawings, vendor instructions and other documentation required to perform the work.

The Construction Contractor should conduct a field walkdown of the work area prior to start of work. The purpose of the field walkdown is to identify design conflicts or field interferences that may be encountered.

Note: The field walkdown shall also consider the movement of the electrical equipment to the area. Rigging, lifting and setting plans should be finalized at this time.

Unless otherwise approved, all equipment installations shall be installed exactly as shown on the drawings and details. The Construction Contractor shall resolve any installation problems and design deviations with the Site Construction Department and shall be documented by the appropriate Field Change Document (FCD).

The Construction Contractor shall perform a safety tour of the work area prior to the start of the work to ensure that the best installation practice is used for equipment installations. Special consideration shall be given when evaluating installations near energized equipment, overhead power lines, and hazardous classified areas.

All torque tensioning of equipment, bus duct and device components shall be performed per manufacturer instructions and shall be documented according to the procedure and shall, at a minimum, cover the items identified in the Project Construction Inspection and Test Plan for Electrical Equipment Activities Template (Sample) as shown in Attachment 3.

Electrical equipment storage/maintenance after installation shall comply with manufacturer instructions.

1. After each piece of equipment is installed, all doors, covers, gaskets, and rain guards shall be installed to keep out moisture and debris and to protect the equipment from harsh weather conditions.

The Construction Contractor shall determine the construction testing requirements in accordance with the vendor requirements, project specifications and procedures.

Electrical equipment shall not be energized until all installation and testing activities are complete, all safety signs have been posted, and all keys utilized in the Construction Contractor's System and Equipment Lockout/Tagout process, have been delivered to the personnel authorized to energize the equipment.

The Construction Contractor shall prepare a set of as-built drawings according to EPM-KCE-PR-0000007 Project Construction As-Built Drawings Procedure and field sketches as per project requirements.

6.3.5 Inspection Activities

As fieldwork progresses and equipment is installed, the Construction Contractor shall continuously monitor installations to ensure they are installed in accordance with the latest drawings and specifications and are protected from damage from construction activities. The Construction Contractor is responsible for identifying and arranging all inspections required by all relevant Authorities.

The Construction Contractor shall perform the following routine inspections and verification of equipment installations:

1. Correct size and rating.
2. Properly mounted/attached.
3. Setting is shimmed, level and square.
4. Correct elevation.
5. Correct hardware used.
6. All packaging and shipping blocks removed.
7. Properly tagged/ID tags installed.
8. Not blocking access to walkways, man-ways, or other equipment.
9. Grounding, bonding and jumpers installed.
10. Wiring and shipping splits properly connected.

11. All fittings and connections are tight and torqued per manufacturer instructions.
12. Verify the nameplate is correct, legible and is permanently attached.
13. Clean and free of debris.

All Equipment installations shall be inspected and documented in accordance with the contract specification and drawings, however the procedure shall at a minimum cover the items identified in the Project Construction Inspection and Test Plan for Electrical Equipment Activities Template (Sample) as shown in Attachment 3.

6.4 Electrical Raceways and Accessories

6.4.1 Raceways and Accessories

This procedure applies to receiving, handling and installing conduit, cable tray with covers, if necessary, and accessories. The raceway design drawings, and the project specifications dictate the type of raceway to be installed. All raceway materials shall meet the requirements of the design drawings, project specifications and local, regional and national codes unless otherwise noted in the contract.

There are four (4) basic types of drawings utilized when installing raceways:

1. The plan drawings. (Issued for Construction-IFC)
2. Standard notes and detail drawings.
3. Underground drawings.
4. Aboveground drawings

Ensure that all installed tray hangers are adequately sized per design requirements for the actual load of each tray section.

The Construction Contractor shall determine the schedule of raceway installation activities and shall identify other discipline commodities that must be installed prior to raceway installation activities and meet project schedule.

6.4.2 Work Preparation/Execution

The Construction Contractor shall develop a work plan for raceway installation and shall prepare an installation schedule that supports the project milestone requirements.

The Construction Contractor shall arrange for all tools and equipment required to complete the work including conduit benders, threaders, welding machines, ladders, band saw, drill press, work tables, cranes, mobile manlifts, pickers, etc. The Construction Contractor shall organize construction site fabrication areas and material storage laydown areas as assigned

The Construction Contractor shall pre-plan underground conduit, embedded raceway and underground duct bank installations according to the drawings with emphasis on the following:

1. All embedded conduit stub-ups shall be inspected prior to concrete placement.
2. Flagging tape should be used for all duct bank pours.
3. All duct banks shall be inspected prior to concrete placement to verify raceway supports, reinforcement, and minimum concrete cover requirements.
4. All soil compaction requirements have been satisfied prior to concrete placement.
5. Coordination with other disciplines to ensure other underground commodities are coordinated.

The Construction Contractor shall perform, for all raceway installations, the following routine inspections and verifications of raceway installations:

1. Correct size and type.
2. Properly supported using correct details.
3. Correct span between supports.
4. Correctly routed at the correct elevation.
5. Correct fittings used.
6. End caps and plugs installed as required.

7. Sharp edges and burrs removed.
8. Proper identification tags or labels installed.
9. Raceway is not blocking access to walkways, man ways, and equipment.
10. Grounding-bonding fittings and/or jumpers installed.
11. No running threads (i.e. over threading) on conduit
12. All fittings and connections tight.
13. For rigid conduit, no more than the equivalent of four quarter bends (360° total) between pull points (i.e., conduit bodies and boxes).
14. Conduits do not exceed maximum bending radius, for the cables installed in the conduit.
15. Pull strings installed if applicable.
16. Flexible connection installed at equipment as required.
17. Conduit to tray is securely connected for a good electrical bond.
18. Verify conduit expansion fittings and seal fittings are installed as required.
19. Verify cable tray expansion joints and splice plates are properly installed.
20. Prepare a set of as-built drawings and field sketches in accordance with project requirements.
21. Verify cable tray covers are installed if required.

All raceway installations shall be inspected and documented in accordance with the contract specification and drawings, however the procedure shall at a minimum cover the items identified in the Project Construction Inspection and Test Plan for Raceways and Cable Trays Activities Template (Sample) as shown in Attachment 1.

6.5 Cable

6.5.1 Cable Installation

The Construction Contractor shall develop a work plan for cable installation and shall prepare an installation schedule based on material delivery dates, manpower availability and project schedule requirements.

The design drawings and the project specifications indicate the type and size of cable to be installed.

All cable materials shall meet the requirements of the design drawings, project specifications and local, regional and national codes unless otherwise noted in the contract.

There are several types of drawings utilized when installing new cable:

1. Single line drawings.
2. Schematic/elementary drawings.
3. Plan drawings.
4. Raceway drawings.
5. Wiring diagrams.
6. Cable and Termination Schedules (Construction Contractor developed).

The Construction Contractor shall arrange for all tools and equipment required to complete cable installation work including tuggers, rollers, sheaves, wheels, feeder tubes, slings, pulling eyes, pulling ropes, jack stands, tensiometer, 2 way radios and work tables, etc.

The Construction Contractor shall check all cable routes and pull set-ups for the minimum bending radius per manufacturer instructions prior to pulling any cable.

All cable reels shall be inspected upon receipt for correct cable size, type and rating. Each reel shall have a unique identification number assigned and shall be clearly marked on the reel. Upon receipt, all power cable shall be megger tested as per project specifications and manufacturer requirements.

The Construction Contractor shall determine construction site cable reel storage requirements based on the manufacturer recommendations for each cable type received. If possible, reels should be stored indoors. When outdoor storage is used, cable reels shall be stored as follows:

1. Upright and off the ground on dunnage.

2. In an area with good drainage and free of construction traffic.
3. All cable including medium and high voltage cables shall have their ends sealed.
4. Cable reels to be rotated according to manufacturer instructions.

6.5.2 Work Preparation/Execution

Rollers, wheels, sheaves, feeder tubes, and other pulling apparatus shall be placed at strategic points in the raceway to minimize the cable tension and bending radius.

All conduit and duct routes shall be clean, free of burrs and sharp edges. It may be necessary to pull a mandrel or swab through conduits and ducts to provide a thorough cleaning.

All cables shall be identified with a unique number as identified by the specifications, drawings and Construction Contractor's Cable/Termination Schedules.

When cutting cable for a pull, the raceway lengths, installed and not installed, shall be reviewed prior to cutting cable from a reel in order to minimize waste.

Lubricants shall be used when pulling into conduits and ducts based on cable specifications requirements and manufacturer instructions.

All cables shall be continuity checked prior to termination.

Specific testing requirements are defined in the project specifications.

Power cables are required to be megger tested after pulling and prior to termination. Medium and high voltage cables normally require Alternating Current (AC) or Direct Current (DC) high potential testing after the connectors have been installed and prior to termination.

The following routine inspections, shall be performed prior to pulling:

1. Correct size, type and rating.
2. Cable and reels are free of damage.
3. Cable ends are sealed to prevent water / moisture damage.
4. Cable reels are tagged with unique identification number.
5. Cable reels are properly stored on chocks, timbers and on reel edges.
6. Cable reel storage area is clean and has adequate drainage.
7. Cable reels are properly spaced and organized to avoid unnecessary handling, cable is stored as per manufacturer recommendations.
8. Bend radius is not exceeded.
9. Proper pull points installed (i.e., raceway is "cable ready").

The following routine inspections, shall be performed as cables are being pulled:

1. Pulling setups are complete.
2. Proper cable attachment for pulling is installed.
3. Proper pulling methods are used.
4. Pulling tensions are not exceeded; If dynamometer is used, readings are recorded.
5. Temporary cable identification tags or labels are installed.
6. Bending radius is not exceeded.

The following routine inspections, shall be performed after cables are pulled:

1. Required cable separation maintained., if required.
2. Ends are sealed, cable is coiled and properly supported, cable is properly tie-wrapped and secured in the tray.
3. Final cable quantity in the raceway does not create an overfill problem.
4. All testing is completed (continuity, megger).

All cable installations shall be inspected and documented in accordance with the contract specification and drawings, however the procedure shall at a minimum cover the items identified in the Project Construction Inspection and Test Plan for Cable/Terminations Installation Activities Template (Sample) as shown in Attachment 2.

The Construction Contractor shall prepare a set of as-built drawings according to EPM-KCE-PR-0000007 Project Construction As-Built Drawings Procedure and field sketches as per project requirements.

6.6 Cable Terminations

The Construction Contractor shall prepare a termination plan that shall also consider weather conditions and manufacturer temperature limits for installations during extreme weather conditions.

The Construction Contractor shall arrange for all tools and equipment required to complete cable termination work including crimp tools, crimp dies, head sets, radios, work tables, etc.
All cables shall be continuity checked prior to termination.

Power cables are required to be megger tested after pulling and prior to termination. Medium and high voltage cables normally require AC or DC high potential testing after the connectors have been installed on the cable ends and prior to termination. Specific testing requirements are defined in the project specifications.

Prior to the termination of any cable, a System and Equipment Lockout/Tagout review shall be completed per the Construction Contractors System and Equipment Safety Lockout/Tagout Procedure.

The following routine inspections shall be performed for all terminations:

1. Properly identified
2. Properly supported and shaped
3. Properly trained and bending radius is not exceeded
4. All connections tight and properly connected
5. Proper strip length
6. Proper lug/connector/termination kit/crimping tool used
7. Crimping tools are calibrated and correct type
8. Bolted connections properly torqued
9. Shrink tube is the correct size, length, and properly applied
10. Shielding is properly dressed, taped, and grounded
11. There are no cuts or gouges in the insulation
12. Conductor strands are not nicked or cut
13. Flexible conduit installed and fittings tight
14. Flexible conduit or rigid conduit is bonded as required by design

The Construction Contractor shall perform, for all cable terminations, the above routine inspections, verifications and documented in accordance with the contract specifications and drawings, however the procedure shall at a minimum, cover the items identified in the Project Construction Inspection and Test Plan for Cable/Terminations Installation Activities Template (Sample) as shown in Attachment 2:

6.7 Construction Electrical Testing

The Construction Contractor shall develop a Work Plan for Electrical Testing of all equipment and cable installations/ terminations, certification and controlling of test equipment, and shall prepare a schedule based on, manpower availability and project schedule requirements.

The Construction Contractor shall arrange for the proper test equipment such as meters, meggers and high pot machines required to complete cable and equipment testing. Test equipment shall be certified and controlled in accordance with the Electrical Work Plan, project specifications, vendor requirements and the applicable Codes and Standards.

This Work Plan for Electrical Testing will establish the basic requirements for construction electrical testing of equipment, cable and devices. This does not cover testing to be completed by others such as Commissioning, Entity, etc.

The Construction Contractor shall as a minimum:

1. Arrange for all testing tools and materials required to complete the work such as test leads, test cords, special test sets, rubber blankets, shields, guards, and flagging.
2. Shall determine if any portion of required construction electrical testing should be subcontracted where the Construction Contractor lacks the capabilities and experience to carry out the required test(s)
3. Shall arrange for safety and work permits, design drawings, vendor drawings, vendor instructions and other documentation required to complete required testing.
4. Shall complete a safety walk prior to starting testing activities to ensure that the testing practice is safely planned and area is isolated from other personnel.
5. Pre-test inspections/verifications for the below listed materials/equipment, as a minimum, should be performed and documented in accordance with the Work Plan for Electrical Testing as specified per contract specification and drawings.

    - Cables and Terminations.
    - Switchgear
    - Transformers.
    - Bus Duct
    - Control Panels
    - Grounding Systems
    - Motor Control Centers
    - Lighting System
    - Motors and Rotating Equipment

The Work Plan shall at a minimum, cover the items identified in the Project Construction Inspection and Test Plan for Cable/Terminations Installation Activities Template (Sample) as shown in Attachment 2 and Project Construction Inspection and Test Plan for Electrical Equipment Activities Template (Sample) as shown in Attachment 3

Records shall indicate the acceptance to specification and vendor requirements and any unacceptable conditions. Exceptions shall be documented and tracked in accordance with Procedure, EPM-KCC-PR-000003 Project Construction Completions and Turnover Procedure.

6.8 Electrical Cable Insulation Resistance

The Construction Contractor shall develop a specific procedure to measure Insulation Resistance for a single conductor cable from conductor to ground. For a Multi-Conductor cable, this test will measure insulation resistance from each conductor to all other conductors in the cable, and from each conductor to ground.

The Construction Contractor’s procedure shall as a minimum cover the followings:

1. Detailed step by step how to carry out the Insulation Resistance Test
2. Inspect cables for signs of damage or deterioration. Check terminating hardware for corrosion, loose fasteners and heat damage
3. Check if cables are installed with adequate support, trained and bending radius is maintained.
4. Inspect to ensure that there are no nicks, gouges, or any other damage to the insulation and conductors. Verify there is no precipitation, contamination or other foreign materials on the cable
5. Verify that all conductors are correctly tagged.
6. Precautions:

    - Conduct a pre-test briefing incorporating a Job Hazard Analysis (JHA.)

- Discuss expected results with involved personnel.
- Areas under test must be clean and free of loose debris.
- Exposed cable ends during testing shall be monitored continuously to preclude unauthorized personnel from contacting cables.
- Ground connections shall be solidly made to clean surface free of dirt, debris or rust.
- Documentation Forms that indicates the results of all testing

6.9 Cathodic Protection

The Construction Contractor shall develop a specific Cathodic Protection installation procedure in accordance with the manufacturer instructions, and applicable engineering specifications and drawings.

6.10 Electric Heat Tracing (if required)

The Construction Contractor shall develop a specific Electric Heat Tracing Installation (If required) procedure in accordance with the manufacturer instructions, and applicable engineering specifications and drawings.

6.11 Working on or Near Energized Electrical Circuits

Working on or Near Energized Electrical Circuits is not the preferred method and is considered a last resort. A System and Equipment Safety Lockout/Tagout procedure is the preferred method of operation.

The Construction Contractor shall develop a specific procedure for personnel working on or near electrical energy sources (temporary or permanent power) to ensure that potential health and safety hazards are identified and controlled, and that appropriate hazard information is communicated to each employee prior to starting a job or task.

7.0 ATTACHMENTS

1. EPM-KCE-TP 000006 - Project Construction Inspection and Test Plan for Raceways and Cable Tray Activities Template
2. EPM-KCE-TP-000007 - Project Construction Inspection and Test Plan for Cable/ Terminations Installation Activities Template
3. EPM-KCE-TP-000008 - Project Construction Inspection and Test Plan for Electrical Equipment Activities Template

Attachment 1 - EPM-KCE-TP-000006 - Project Construction Inspection and Test Plan for Raceways and Cable Tray Activities Template

Activity No.	Activity Description	Inspection/Test Requirements		Reference Documentation		Method of Verification (see Legend)			Demonstrated Evidence Report/Checklist Reference No.
		Test or Inspection Performed	Stage/ Frequency	Code/Spec/ etc.	Acceptance Criteria	Construction Contractor	Site Construction Department	Entity (EPMO)	
1.0	**Document review**								
1.1		Confirm documents: • Design drawing • Method statement • Material submittal	Prior to commencement	Project Specific	Project Specific				
2.0	**Material receiving inspection**								
2.1		Visual inspection for damage, deformity and correct label	Project Specific	Project Specific	Project Specific				
3.0	**Storage**								
3.1		Refer to method statement & manufacturer's recommendation	Project Specific	Project Specific	Project Specific				
4.0	**Pre-installation check sheet**								
4.1		Check physical condition of materials	Project Specific	Project Specific	Project Specific				
4.2		Check size & type of materials	Project Specific	Project Specific	Project Specific				
4.3		Segregate different materials where necessary	Project Specific	Project Specific	Project Specific				
5.0	**Installation - supports**								
5.1		Check the material of construction for supports	Project Specific	Project Specific	Project Specific				
5.2		Check the size of the support against drawing	Project Specific	Project Specific	Project Specific				
5.3		Check the precise location of the support	Project Specific	Project Specific	Project Specific				
6.0	**Installation - cable trays, ladder racks, other raceways**								
6.1		Check the routing of raceway (Bend radii, access, separation)	Project Specific	Project Specific	Project Specific				
6.2		Carry out regular dimensional and elevation checks	Project Specific	Project Specific	Project Specific				
6.3		Check the correct material of construction for all material	Project Specific	Project Specific	Project Specific				

Attachment 2 - EPM-KCE-TP-000007 - Project Construction Inspection and Test Plan for Cable/Terminations Installation Activities Template

Activity No.	Activity Description	Inspection/Test Requirements		Reference Documentation		Method of Verification (see Legend)			Demonstrated Evidence Report/Checklist Reference No.
		Test or Inspection Performed	Stage/ Frequency	Code/Spec/ etc.	Acceptance Criteria	Construction Contractor	Site Construction Department	Entity (EPMO)	
1.0	**Document review**								
1.1		Confirm documents: • Design drawing • Method statement • Material submittal • Pulling calculation	Prior to commencement	Project Specific	Project Specific				
2.0	**Material receiving inspection**								
2.1		Visual inspection for damage, deformity and correct label	Project Specific	Project Specific	Project Specific				
3.0	**Storage**								
3.1		Refer to method statement & manufacturer's recommendation	Project Specific	Project Specific	Project Specific				
4.0	**Pre-installation**								
4.1		Check conduit / duct / tray condition – damage / blockage / bend radii/equipment installation	Project Specific	Project Specific	Project Specific				
5.0	**Installation**								
5.1		Visual inspection for identification, damage and removal of rollers / pulleys / etc.	Project Specific	Project Specific	Project Specific				
5.2		Visual inspection of terminal blocks, lugs and identification	Project Specific	Project Specific					
6.0	**Cable Continuity**								
6.1		Megger test	Project Specific	Project Specific	Project Specific				
6.2		High Pot Test (if required)	Project Specific	Project Specific					
7.0	**Final Acceptance**								
7.1		All records signed off and closed	Project Specific	Project Specific	Project Specific				

Attachment 3 - EPM-KCE-TP-000008 - Project Construction Inspection and Test Plan for Electrical Equipment Activities Template

Activity No.	Activity Description	Inspection/Test Requirements		Reference Documentation		Method of Verification (see Legend)			Demonstrated Evidence Report/Checklist Reference No.
		Test or Inspection Performed	Stage/ Frequency	Code/Spec/ etc.	Acceptance Criteria	Construction Contractor	Site Construction Department	Entity (EPMO)	
1.0	**Document review**								
1.1		Confirm documents: • Design drawing • Method statement • Material submittal	Prior to Commencement	Project Specific	Project Specific				
2.0	**Material receiving inspection**								
2.1		Visual inspection for damage, deformity and correct size/type/rating/labeling	Project Specific	Project Specific	Project Specific				
3.0	**Storage**								
3.1		Refer to method statement & manufacturer's recommendation	Project Specific	Project Specific	Project Specific				
4.0	**Pre-installation check sheet**								
4.1		Verify foundation / structural steel complete and certified	Project Specific	Project Specific	Project Specific				
4.3		Verify orientation of Duct runs/cable ways/ conduit in building complete and certified	Project Specific	Project Specific	Project Specific				
		Factory Acceptance Test completed	Project Specific	Project Specific	Equipment Specific				
5.0	**Installation**								
5.1		Verify equipment alignment and level as per layout drawing	Project Specific	Project Specific	Project Specific				
5.2		Holding bolts tightened as per the spec	Project Specific	Project Specific	Project Specific				
5.4		Equipment nameplates correct	Project Specific	Project Specific	Project Specific				
5.5		Bus bar arrangements installed as per installation drawing	Project Specific	Project Specific	Project Specific				
5.6		Verify correct phase relationship throughout the bus bar	Project Specific	Project Specific	Project Specific				
5.7		Verify bus bar connections correct and torqued properly	Project Specific	Project Specific	Project Specific				
5.8		Verify connection to main electrical ground/ earth	Project Specific	Project Specific	Project Specific				
5.9		Sealed against weather, insects, etc.	Project Specific	Project Specific	Project Specific				