Industrial Electrical Machines and Drives Servicing Level II

Learning Guide -40

Unit of Competence: - **Perform Commissioning of Electrical Equipment/Systems**

Module title: - **Performing Commissioning of Electrical Equipment/Systems**

LG Code: - EEL EMD2 M06 0919 LO3- LG40

TTLM code: - EEL EMD2 M06 0919 V1

LO3:- Turn-Over Electrical Equipment/Systems

Instruction Sheet	Learning Guide 25

This learning guide is developed to provide you the necessary information regarding the following Learning out comes and contents

Module learning out comes and contents

- Undertaking Inspect electrical equipment/system
- Checking and returning tools, equipment and any excess resources and materials cleaning
- Preparing and submitting written report
- Accomplishing monitoring data sheet for the newly installed system
- Providing Orientation and technical assistance

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, **upon completion of this Learning Guide, you will be able to**:

- Undertake Inspect electrical equipment/system
- Check and return tools, equipment and any excess resources and materials clean
- Prepare and submit written report
- Accomplish monitor data sheet for the newly installed system
- Provide Orientation and technical assistance

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to provide the learners with the required knowledge and skill to cast concrete.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.

2. Follow the instructions described below
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks" for each information sheet.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets and LAP Tests if any”. However, if your rating is unsatisfactory, ask your teacher for further instructions or go back to Learning Activity.
7. After you accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result;
8. Then proceed to the next information sheet.

Information Sheet-1	Undertaking Inspect Electrical Equipment/System

1.1 Undertaking Inspect Electrical Equipment/System

The purpose of this testing manual is to provide guidelines for inspection and testing of Various Electrical Equipment in compliance to relevant international standards/specifications.It provides information on procedures and testing of Major Electrical equipment's to be followed during testing by engineers and also furnish evidenc ethat an electrical equipment/device is free of inherent flaws or faults.

The tests on equipment/system have been broadly categorized into two categories viz.Fa ctory Acceptance Test (FAT) and Site Acceptance Tests (SAT). These tests have been tailored to ensure design, construction and performance requirements of each equipment This testingmanual includes High Voltage Switchboards, Low Voltage Switchboards, Transformer, Diesel Generator Sets, Induction Motors, Cables, Uninterrupted Power Supply (UPS), Ring Main Unit, Light Fittings, MOV Actuators, Isolator Switch andE arthing Systems etc. However in this Paper only highlights the high voltage cables andrel ated test methods.

Benefits

Most useful practical information regarding the Factory Acceptance Tests (FAT) &Site Ac ceptance Tests (SAT) activities.

Highlights the type of test and their desired result values. These values are derived from the International standards, manufacturer's guidelines and good practical experiences.

It covers for all major Electrical Equipment.

Simplifies procedures/integration requirements are fulfilled.

Improve the quality control of the project and simplify the procedures for engineers.

Saving of material searching time.

Factory Acceptance Tests (FAT)

The Routine tests shall be made with each Electrical Equipment and, whenever practicab le,at the manufacturer's works to ensure that the product is in accordance with the equip menton which the type tests have been carried out.

The factory acceptance tests consist of Routine, Type Tests and Special tests (pro jectspecific) as per company and International standards. Routine tests may comprise,
Functional tests - Mechanical Operation Test -Test on auxiliary equipment-
Verification ofcorrect wiring.
Dielectric Tests - It is presumed that every such equipment would also comply with the type test, since design is identical.
The factory inspection and testing are conducted according to Company/internation alstandards.

INSPECTION OF INSTALLED APPARATUS

Installation, appliances connected to it. In adverse events, the leakage current flowing through it may cause severe electrical shock to the person coming in physical contact with it. In order to test this, the main switch should be in open position. All other circuit contacts like bulbs and switches should be ON position. The Earth continuity tester is then connected between the switch / conduit and an independent earth. The tester will indicate the value of resistance. In all cases the value should not exceed more than 1 ohm. If the value appears higher than 1 ohm it indicates that the switch / conduit is not properly earthed.

Visual Inspection

A regular visual inspection should be carried out in all electrical installations. A visual inspection of this type does not necessarily need to be carried out by an electrician, but it should reveal any areas which are obviously in need of attention.
A visual inspection should look for:

- Breakages
- Wear & deterioration
- signs of over heating
- missing parts (covers, screws) and
- Loose fixings and confirm
- Switchgear accessibility (no obstructions) and
- Doors of enclosures are secure It should also check the operation of
- Equipment – switch on & off where equipment is not in regular use or where it is left off or on standby for long periods and

- Residual current devices using test button.(It is recommended that, independent of any other inspection and test regime, residual current devices undergo a push-button test at least twice per year to ensure that they operate correctly when needed).

These routine checks need not to be carried out by an electrically skilled person but should be done by someone who is able to safely use the installation and recognise any obvious defects.

FUNCTIONAL TEST OF INSTALLED APPARATUS

Functional test

Whether they are properly installed and adjusted, all assemblies, such as switchgear and control gear assemblies, drives, controls and interlocks, should be functionally tested to show that they are properly mounted, adjusted and installed in accordance with the relevant requirements of the standard. Protective devices must be functionally tested and checked.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page

Choose the Best Answer

1. The two broad categories of tests on electrical equipment /system are:

A. factory acceptance test B. site acceptance test C. both A & B are answers D. all of these E. none of these

2. The testing manuals include:

A. induction motor B. switch boards C. cables D. all of these E. none of these

3. Which of the following are benefits of factory and site acceptance tests?

A.It covers for all major Electrical Equipment

B. Simplifies procedures/integration requirements

C. Improve the quality control of the project

D. Saving of material searching time.

E. All of these

4. A visual test should look for except:

A. Breakages

B. Wear & deterioration

C. signs of over heating

D. Switchgear accessibility

E. None of these

5. Functional Test of Installed Apparatus Include

A. All Assemblies B. Drives C. Controls D. All of These E. None of These

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

ANSWER SHEET

1. C

2. D
3. E
4. E
5. D

Information Sheet-2	Checking and Returning Tools, Equipment and Any Excess Resources and Materials Cleaning

3.2. Checking and Returning Tools, Equipment and Any Excess Resources and Materials Cleaning

After checking and returning tools, equipment and any excess resources to their proper places, materials cleaning are very important tasks in working areas.

Cleaning is the removal of all visible soil in an approved way with the use of mechanical and chemical action or both, so that all areas are cleaned and sanitised to a high standard. Cleaning is an investment in the assets of a building especially in electrical equipment/ system area. Maintenance is the upkeep of all furniture, fittings and equipment to an exacting standard within the property so that all areas look consistently new and pristine.

Why do we clean?

There are many reasons why we clean but the most important ones are -

Health Regulations

If your local government authority has health regulations regarding cleaning and sanitizing, then you must know these and follow their recommendations at all times. It is important when you are cleaning that you clean to a high standard that has been set for you by your supervisor or manager. Failure to clean properly and remove rubbish may result in pest infestation and bad smells caused by rotting rubbish. Failure to clean will ultimately lead to a loss of business through guest complaints and investigations by local health inspectors. If these are not cleaned and maintained regularly, fixtures and fittings will need to be replaced more often, at an ever increasing cost to the property owner e.g. If a carpet is never vacuumed or spot cleaned, eventually the carpet will deteriorate to the point where it will need to be replaced as it cannot be recovered through cleaning.

To Maintain a Safe and Clean Environment If the property is clean and well-maintained it is more likely to be safe. If spills are not cleaned promptly people can slip and be hurt. If carpets have holes or chairs are broken this can lead to injuries and possible financial compensation claims against the hotel.

To Improve Staff Morale All staffs who serve the general public must feel positive about their work environment particularly electrical equipment/ system area, if they are to give good service. There should not be different cleaning and maintenance standards between front and back of workshop areas. All staff needs to feel they work in a safe and clean place. This will improve staff morale and lead to happy staffs that will care for the visitors who will want to return so ensuring staff retain their employment.

Where do we clean?

The short answer to this question is EVERYWHERE particularly electrical equipment/ system area. As a member of the cleaning team, you may be responsible for front of workshop areas or back of building areas or some of both. Front of workshop is where all trainers and trainees as well as workshop assistants and customers have access during their stay. Back of workshop areas are where staff works and to where visitors do not have access.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page**.**

SAY TRUE OR FALSE

1. After checking and returning tools, equipment and any excess resources to their proper places, materials cleaning are very important tasks in working areas.
2. Cleaning is the removal of all visible soil in an approved way with the use of mechanical and chemical action or both.
3. There are many reasons why we clean electrical equipment/system areas, but the most important one is health regulations.
4. To maintain a safe and clean environment and if the property is clean and well-maintained, it is not more likely to be safe.
5. To improve staff morale all staffs who serve the work shop must feel negative about their work environment.

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

ANSWER SHEET

1. TRUE

2. TRUE
3. TRUE
4. FALSE
5. FALSE

Information Sheet-3	Preparing and Submitting Written Report

3.3. Preparing and Submitting Written Report

Report Writing Where

Relates to the location the event took place, or subsequent locations, depending on the type of incident.

Why

It may explain the reason for the occurrence, but can not be speculation or unfounded opinion.

How

Relates to how the event came to your attention, how it occurred. This means thecomplete details about how the event happened from start to finish.

Report Organization

Introduction

Should include the date and time, the location, people involved, and whathappened.

Body

Chronological narrative of what actually occurred, observations made, and subsequent interviews and inquires, witnesses names, statements, and descriptions.

Conclusion

What follow-up actions are still required and expected time of completion, preventative action taken, and a brief summary of points that are not completely answered in the body of the report.

Formal Reports

A formal report contains the following:

1. Title Page: includes the title of the project/report, to whom the report is submitted, by whom it isprepared, the date it is written (*not* the date the report is due!), and the **abstract**. (An example title page isshown on the next page.)

2. Abstract: a *short* paragraph indicating what the project was and what solution was found

3. Table of Contents: contains page numbers of the titles and subtitles of different section s of the report.

4. Introduction: a brief description of the problem, how it was approached, and what proc edure wasused to solve it. It may also give the reader some information on what was done in the sections followingthe introduction (for longer reports).

5. Development: describes the details of the methods, procedures, techniques, etc., use d in solving theproblem. This section usually has subsections such as model development , calculations, experimentalprocedure, applications, etc.

6. Discussion: a discussion of the findings and any discrepancies.

7. Conclusion and Suggestions: This section is a brief summary of what the findings wer e and what thesignificance of the work is. If it is a research project, it also contains sugges tions about future researchareas

8. References: This is a list of the books, reports, papers, Internet sources, and computer software thatwere used to complete the project and write the report. All references listed m ust be cited in the report; **ifno references are *cited*, don't *list* any.** References are listed in the same order in which they were *first* cited.

Informal Reports

An informal report consists of a memo plus attachments and contains the following sections:

- **Heading** (required)**:** To whom the report is submitted, who wrote it, when it was *wri tten* (*not* the datethe report is due!), and what it is about. (An example of the first page of an informal report is included onthe following page.)
- **Summary** (required)**:** The summary is a brief (one or two paragraphs) description of t he project andthe results, plus a brief mention of cost and schedule (so that managers d on't have to read the entire report

to find this information). It should never extend onto the second page of the report and in m ost cases willnot contain figures, tables, or equations.

- **Design** (optional)**:** Describes how the circuit or system was designed.
- **Testing** (optional)**:** Describes how the circuit or system was constructed and tested.
- **Simulations** (optional)**:** This section includes the *results* of any numerical simulations done for theproject. (Listings of computer code belong in an attachment unless develo pment of the code was thepurpose of the project.) If the simulations are an integral par

t of the design process, include thesimulation results in the **Design** section and omit thi s section.

- **Results** or **Conclusion** (required): This section summarizes the results of the project, compares themeasured results to the design goals and numerical simul ations, gives detailed breakdowns of costs andtime spent (if required), etc.
- **References** (required if any references are cited)**:** This section contains a list of all ref

  s should be listed in numericalorder (of course!) and in the order in which they are *fi rst* cited. The **References** are *not* placed on aseparate page.
- **Attachments** (optional)**:** Attachments to an informal report serve the same function as appendices ina formal report. Attachments are numbered (or lettered) and are att ached to the end of the report innumerical (or alphabetical) order. The order must b e the same as the order in which the attachments were*first* cited in the report. *All att achments must be cited by number* (*or letter*) *in the text of the report*. Pagenumbers are not required on attachments.

In an informal report, each section does *not* have to start on a separate page. However, nev er end apage with a section heading.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page**.**

Choose the Best Answer

1. Report writing relates to the location the event took place or subsequent locations depending on the type incident.
   A. True B. False
2. A formal report contains the following formats except:
   A.titlepage B.abstract C. table of contents D.introduction E. none of these
3. Informal report consists of a memo plus attachments and contains:
   A. heading B.summary C. design D. testing E. all of these
4. _____ includes the title of the project /report:
   A.titlepage B.abstract C. table of contents D.introduction E. none of these
5. _____ describes how the circuit or system was designed:
   A. testing B.design C. simulation D. result E. none of these

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____
Rating: _____

Name: _____ Date: _____

ANSWER SHEET

1. A
2. E
3. E
4. A
5. B

Information Sheet-4	Accomplishing Monitoring Data Sheet for the Newly Installed System

3.4 Accomplishing Monitoring Data Sheet for the Newly Installed System

Accomplishing Monitoring Data Sheet for the Newly Installed electrical equipment /System is a mandatory issue for the new buildings.

Functional performance testing verifies the intended operation of individual components and system interactions under various conditions and modes of operation. The systems are run through all of the sequences of operation and the response of components is verified. Testing proceeds from components to subsystems to systems, and finally to interlocks and connections between systems.

The commissioning agent prepares functional performance test plans so that the complete sequence of operations is included. The commissioning agent obtains all documentation, including an updated points list, control sequences, and setpoints. If necessary, the commissioning agent may request clarifications from contractors and the design team regarding sequences and operation. Prior to execution, the commissioning agent provides a copy of the primary equipment tests to the installing subcontractor and general contractor who can review the tests for feasibility, safety, warranty and equipment protection for electrical equipment /system.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page**.**

SAY TRUE OR FALSE

1. Functional performance testing verifies the intended operation of individual components and system interactions.
2. Testing proceeds from components to systems, and finally to interlocks and connections between systems.
3. The commissioning agent prepares functional performance test plans, however, the complete sequence of operations is not included.
4. General contractor reviews the tests for feasibility, safety, warranty and equipment protection for electrical equipment /system.

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

ANSWER SHEET

1. TRUE
2. TRUE
3. FALSE
4. TRUE

Information Sheet-5	Providing Orientation and Technical Assistance

3.5 Providing Orientation and Technical Assistance

Providing technical orientation and technical assistance for the operator or maintenance man is a vital issue in order to sustained electrical commissioning for electrical equipment / system in the workshop.

Effective maintenance personnel training is a critical to the long term performance of the electrical equipment/system. The commissioning agent will assist the owner and general contractor in organizing the training sessions by identifying the appropriate staff for each session and creating an overall training plan. For each training session, the contractors provide a detailed agenda for each piece of equipment or system for which training is required. The agenda describes the training scope, duration, and methods, along with the name and qualifications of the trainers.

The commissioning agent develops a plan for including in the training session contractors / trainers from different disciplines, when appropriate. The trainer documents each training session (duration, general subjects covered, and attendees). The commissioning agent may witness any of the training sessions.

Self-Check –5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page**.**

Choose the Best Answer

1. Providing technical orientation and technical assistance for the operator or maintenance man is a vital issue.
   A.TRUE B. FALSE
2. Effective maintenance personnel training is not a critical to the long term performance of the electrical equipment/system.
   A.TRUE B. FALSE
3. The commissioning agent assists the owner and general contractor in organizing the training sessions.
   A.TRUE B. FALSE
4. The contractors provide a detailed agenda for each piece of equipment or system for which training is required.
   A.TRUE B. FALSE
5. The ORIENTATION agenda describes:
   A. Training scope B. Duration C. Methods D. All of these E. None of these
6. The trainer documents each training session which consists of :
   A. Duration B. General subjects covered C. Attendees D. All of these E. None of these

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

ANSWER SHEET

1. A
2. B
3. A
4. A
5. D
6. D

REFERENCES MATERIALS

1. Advanced Electrical Installation Work FIFTH EDITION

2. Practical Troubleshooting of Electrical Equipment and Control Circuits

3. TTLM