Intermediate Home/Office Electrical/ Electronic Equipment Servicing - Level-III

Based on May, 2011 Version OS and February, 2021 Version Curriculum

Module Title: Commissioning Home/Office Electrical/Electronic Equipment

LG Code: EEL HOS3 03 M03 0221 LO (1-3) LG (8-10)

TTLM Code: EEL HOS3 TTLM 0221 v1

February 2021

Bishoftu, Ethiopia

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Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Obtaining and understanding OHS procedures for a given work area
- Preparing and establishing OHS risk control measures and procedures for the following work.
- Implementing safety hazards
- Consulting appropriate personnel.
- identifying system operating parameters by reviewing
- Obtaining tools, equipment and applications
- Preparing and checking work
- Checking Circuits as being isolated according to OHS requirements and procedures.

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

- Obtain and understand OHS procedures for a given work area
- Prepare and establish OHS risk control measures and procedures for the following work.
- Implement safety hazards
- Consult appropriate personnel.
- identify system operating parameters by reviewing
- Obtain tools, equipment and applications
- Prepare and checking work
- Check Circuits as being isolated according to OHS requirements and procedures

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 your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer 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
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Obtain and understand OHS procedures for a given work area

1.1 Obtain and understand OHS procedures for a given work area

Occupational Health and Safety

A health and safety program is a definite plan of action designed to prevent accidents and occupational diseases. Some form of a program is required under occupational health and safety legislation in most Canadian jurisdictions. A health and safety program must include the elements required by the health and safety legislation as a minimum.

Because organizations differ, a program developed for one organization cannot necessarily be expected to meet the needs of another. This document summarizes the general elements of a health and safety program. This approach should help smaller organizations to develop programs to deal with their specific needs.

Policy Statement

An organization's occupational health and safety policy is a statement of principles and general rules that serve as guides for action. Senior management must be committed to ensuring that the policy is carried out with no exceptions. The health and safety policy should have the same importance as the other policies of the organization.

The policy statement can be brief, but it should mention:

- Management's commitment to protect the safety and health of employees.
- The objectives of the program.
- The organization's basic health and safety philosophy.
- Who is accountable for occupational health and safety programs.
- The general responsibilities of all employees.
- That health and safety shall not be sacrificed for expediency.
- That unacceptable performance of health and safety duties will not be tolerated.

The policy should be:

- Stated in clear, unambiguous, and unequivocal terms.
- Signed by the incumbent Chief Executive Officer.
- Kept up-to-date.
- Communicated to each employee.
- Adhered to in all work activities.

1) all supervisors are responsible for ensuring that their employees are trained in approved work procedures and to ensure that employees follow safe work methods and all related regulations;

2) all personnel are required to support the OSH program and make safety and health a part of their daily routine and to ensure that they are following safe work methods and relevant regulations;

3) all personnel will be held accountable for implementing this program; and

4) all relevant laws and regulations are incorporated in our program as minimum standards

Signed by the manager

What are the program elements ?

While organizations will have different needs and scope for specific elements required in their health and safety program, the following basic items should be considered in each case:

- Individual responsibility.
- Joint occupational health and safety committee.
- Health and safety rules.
- Correct work procedures.
- Employee orientation.

- Training.
- Workplace inspections.
- Reporting and investigating accidents/incidents.
- Emergency procedures.
- Medical and first aid.
- Health and safety promotion.
- Workplace specific items.

What are individual OH&S responsibilities ?

Health and safety is the joint responsibility of management and workers. Management is accountable for non-compliance to health and safety legislation.

Responsibility may be defined as an individual's obligation to carry out assigned duties. Authority implies the right to make decisions and the power to direct others. Responsibility and authority can be delegated to subordinates, giving them the right to act for superiors. It is important to note that, while some responsibilities can be delegated, the superior remains accountable for seeing that they are carried out.

Individual responsibilities apply to every employee in the workplace, including the Chief Executive Officer. All employees will then know exactly what is expected of each individual in health and safety terms.

To fulfill their individual responsibilities, the people must:

- Know what these responsibilities are (communication required).
- Have sufficient authority to carry them out (organizational issue).
- Have the required ability and competence (training or certification required).

Once all these criteria have been met, safety performance can be assessed by each individual's supervisor on an equal basis with other key job elements. Health and safety is not just an extra part of an employee's job: it is an integral, full-time component of

each individual's responsibilities.

What are examples of responsibilities of workers?

Examples of responsibilities of workers include:

- Using personal protection and safety equipment as required by the employer.
- Following safe work procedures.
- Knowing and complying with all regulations.
- Reporting any injury or illness immediately.
- Reporting unsafe acts and unsafe conditions.
- Participating in joint health and safety committees or as the representative.

What are the responsibilities of first-line supervisors?

Examples of responsibilities of first-line supervisors include:

- Instructing workers to follow safe work practices.
- Enforcing health and safety regulations.
- Correcting unsafe acts and unsafe conditions.
- Ensuring that only authorized, adequately trained workers operate equipment.
- Reporting and investigating all accidents/incidents.
- Inspecting own area and taking remedial action to minimize or eliminate hazards.
- Ensuring equipment is properly maintained.
- Promoting safety awareness in workers.

What are the responsibilities of management?

Examples of responsibilities of management include:

- Providing a safe and healthful workplace.
- Establishing and maintaining a health and safety program.
- Ensuring workers are trained or certified, as required.
- Reporting accidents/incidents and cases of occupational disease to the appropriate authority.
- Providing medical and first aid facilities.
- Ensuring personal protective equipment is available.

- Providing workers with health and safety information.
- Supporting supervisors in their health and safety activities.
- Evaluating health and safety performance of supervisors.

Responsibilities of safety coordinators

Examples of responsibilities of safety coordinators include:

- Advising all employees on health and safety matters.
- Coordinating interdepartmental health and safety activities.
- Collecting and analyzing health and safety statistics.
- Providing health and safety training.
- Conducting research on special problems.
- Attending joint health and safety committee meetings as a resource person.

Purpose of joint health and safety committee

An effective safety program needs the cooperative involvement of all employees. A joint health and safety committee is a forum for cooperative involvement of employees representing both labor and management. Such committees are statutory requirements for organizations of a specified minimum size in most Canadian jurisdictions. The responsibilities of members are generally spelled out in the health and safety legislation across Canada.

A joint health and safety committee brings together labor's in-depth, practical knowledge of specific jobs and management's larger overview of job interrelationships, general company policies and procedures.

To function properly, the committee needs an appropriate structure, a clear statement of purpose and duties, and standard procedures for meetings. An employer does this by establishing terms of reference for the committee and by allocating adequate resources.

The employer must establish a committee is organized and operates in compliance with the law, is effective, involves the widest range of employees, and provides resources (e.g., time, money, meeting rooms) so the committee can do its work. These requirements are known as "terms of reference". Common terms of reference include:

- Stating senior management's commitment to act on the committee's recommendations.
- Defining how long a person will serve on the committee (if not specified by legislation).
- Establishing how a committee member will be chosen, etc.
- Once the committee members have been chosen, the committee should participate in decisions on the details of its structure, duties, and procedures.
- Establish a reporting structure. In a general sense, each committee member is responsible to the chairperson(s), and the committee as a whole to all employees for fulfilling their duties. However, if prompt follow-up to recommendations is to be expected, one individual should be named as a person in authority. The best choice is usually a member of senior management. This individual should have sufficient authority to be able to take or expedite direct action as required.
- The joint health and safety committee members should be active participants in the development, implementation, and monitoring of all phases of the health and safety program.

Establishment of correct work procedure

Governmental health and safety regulations represent minimum requirements. In almost all cases, organizations will have to augment these regulations with specific rules.

We need rules – to protect the health and safety of workers – but there are dangers in having either too few or too many rules. Too few rules may be interpreted as a sign that health and safety are not important, or that common sense is all that is required to achieve them. Too many rules may be seen as not treating employees as thinking adults and makes enforcement of all rules less likely. Following are some guidelines for establishing rules:

- Rules should be specific to health safety concerns in the workplace.
- The joint health and safety committee should participate in their formulation.
- Rules should be stated in clearly understandable terms.

- Rules are best stated in positive terms ("employees shall" not "employees shall not").
- The reasons for the rule should be explained.
- Rules must be enforceable, since disregard for one rule will lead to disregard for others.
- Rules should be available to all employees in written form, in the languages of communication of employees.
- Rules should be periodically reviewed to evaluate effectiveness and to make changes for improved effectiveness.
- Compliance with health and safety rules should be considered a condition of employment. Rules must be explained to new employees when they start work or if they are transferred or retrained. After a suitable interval, these employees should be briefed to ensure they understand the rules applicable to their work.
- The employer must establish procedures for dealing with repeat rule violators. Supervisors are responsible for correcting unsafe acts, such as a breach of rules, and they must be supported in this duty. Points that should be considered in establishing procedures on this issue are:
- Ensure that employees are aware of the rule.
- Ensure that employees are not encouraged, coerced, or forced to disregard the rule by fellow employees.
- All rules are to be observed.
- No violation will be disregarded.
- The role of discipline is that of education, not punishment.
- Action is taken promptly.
- While having guidelines for penalties for the first offence or infractions may be desirable, some flexibility is required when applying the guidelines since each case will vary in its circumstances.
- Action is taken in private, and recorded.

Job safety analysis involves the following steps:

1. Select the job.

2. Break down the job into a sequence of steps.

3. Identify the hazards.

4. Define preventive measures.

The analysis should be conducted on all critical tasks or jobs as a first priority. Critical jobs include:

- Those where frequent accidents and injuries occur.
- Those where severe accidents and injuries occur.
- Those with a potential for severe injuries.
- New or modified jobs.
- Infrequently performed jobs, such as maintenance.

Job safety analysis is generally carried out by observing a worker doing the job. Members of the joint health and safety committee should participate in this process. The reason for the exercise must be clearly explained to the worker, emphasizing that the job, not the individual, is being studied. Another approach, useful in the analysis of infrequently-performed or new jobs, is group discussion.

A work procedure may consist of more than one specific task. In such cases, each separate task should be analyzed to complete a job safety analysis for that procedure. The final version of the correct work procedure should be presented in a narrative style format that outlines the correct way to do the job in a step-by-step outline. The steps are described in positive terms, pointing out the reasons why they are to be done in this way. Reference may be made to applicable rules and regulations and to the personal protective equipment required, if any. Employees who carry out the tasks should be consulted in developing the procedure.

Importancy of the orientation of the employee

Health and safety education should start with employee orientation when an employee joins the organization or is transferred to a new job. It has been found that inexperienced workers, in general, are involved in accidents at a higher rate than others. While experience can only be gained through time, both health and safety education and job skills training can be used to improve this record. Orientation sessions normally cover

such items as explanation of the function of the work unit, organizational relationships, administrative arrangements, and miscellaneous policies and rules.

Items related to health and safety that should be included are:

- Emergency procedures.
- Location of first aid stations.
- Health and safety responsibilities, including those specified by legislation.
- Reporting of injuries, unsafe conditions and acts.
- Use of personal protective equipment.
- Right to refuse hazardous work.
- Hazards, including those outside own work area.
- Reasons for each health and safety rule.

A new employee can be expected to absorb only a certain amount of information in the first few days. A brochure outlining the points covered in the orientation sessions is useful as a handout to employees. It also serves as a checklist for the person conducting the orientation. A buddy system is a useful follow-up to the initial orientation. This system allows for on-the-job reinforcement of the information presented to the new employee. This process also promotes the safety awareness of the experienced workers who are the "buddies".

New, inexperienced or transferred employees should be encouraged to ask questions at any time when doubt exists as to correct procedures. The new employee orientation may include a set of questions, such as the following:

- What are the hazards of the job?
- Is job safety training available?
- What safety equipment do I need to do my job?
- Do I need to wear personal protective equipment (PPE)? Will I receive training on how to use the PPE?
- What do I do in case of fire or another emergency?
- Where do I find fire extinguishers, first aid kits, first aid rooms and emergency assistance?

- What are my responsibilities regarding health and safety?
- If I notice something wrong, to whom should I report?
- Who is responsible for answering safety-related questions?
- What do I do if I get injured or have an accident?

Soon after the orientation sessions, employees should be assessed on their understanding of the items discussed. In this way, both the quality of training and the level of understanding can be evaluated.

Self-Check -1	Written Test

Directions: Answer all the questions listed below.

I. Say True or False **(each 1point)**

1. all supervisors are not responsible for ensuring that their employees follow safe work practice.
2. Rules should be stated in clearly understandable terms.
3. The employer must establish procedures for dealing with repeat rule violators.
4. Emergency procedures are not important for employees.
5. A new employee can be expected to absorb only a certain amount of information in the first few days.

Part II fill the blank space

1. List down some of the items related to health and safety! (5%)

_____,_____

_____,_____

_____,_____

2. Mention Job safety analysis! (5%)

_____,_____,_____

Answer the following question!

Note: **Satisfactory rating - 8 and 15 points Unsatisfactory - below 8and 15points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____ Date: _____

Score = _____

Rating: _____

Information Sheet 2- Preparing and establishing OHS risk control measures and procedures for the following work.

1.2. Preparing and establishing OHS risk control measures and procedures for the following work.

Purpose

The purpose of this Standard is to ensure OHS risk management is an integral part of college operations. This means the consideration of OHS risks will be part of research, teaching, partnerships, tenancies, purchasing, design, change processes, system building and project planning processes (see also University Risk Management Procedure). This in turn will ensure compliance with the OHS legislation and the college's Health, Wellbeing and Safety policy.

Minimum Compliance Requirements

To comply with the OHS Act, the responsible manager must carry out and document the following:

- Identify the OHS risks associated with any new activity, material or equipment.
- The identified OHS risks must be considered and if they are not clearly low then a formal Risk Assessment must be carried out.
- The Risk Assessment consists of the following steps:

    - ✓ Considering the context of the activity, material or equipment.
    - ✓ Identifying the associated hazards and how they create an OHS risk in this situation.
    - ✓ Considering any existing control measures and how they reduce the risk.
    - ✓ Assessing the risk level as appropriate either overall or for components of the activity, material or equipment taking into account existing control measures.
    - ✓ Identifying and considering additional control measures that will reduce the risk further.

- ✓ Assigning and scheduling the additional control measures.
- ✓ Assessing the final risk leve.
- ✓ Making a record of the above steps and keeping that record for five years.

OHS Risk Management Standard

Staff members and contractors are responsible for:

- assisting with the identification of hazards, the assessment of risks and implementation of risk control measures;
- reporting promptly any incident, accident or hazard in the workplace to their manager or supervisor; and
- using the required control measures, working safely and not putting themselves or others at risk of injury.

Academics (in charge of classes, study units or research teams), Managers and Supervisors are responsible for:-

- organizing risk assessments and ensuring they are undertaken and documented,
- maintaining, regularly monitoring and reviewing control measures.
- consulting workers and their health and safety representatives at each step of the risk management process;
- informing staff and students fully about hazards associated with activities being carried out.
- adequately training and instructing staff and students in control measures and safe working procedures.
- providing appropriate level of supervision especially to inexperienced staff and students.
- allocating the resources required to prevent injury and minimize risk.
- providing contractors/sub-contractors and their workers with information about known hazards of the environment in which they will work to enable them to determine an appropriate safe system of work.

- providing volunteers and visitors with appropriate information about any hazards and control measures

Executive Deans, Heads of Schools, and (Executive) Directors are responsible for maintaining and refreshing risk management processes within their responsible areas, specifically:

- The regular review of hazards within all areas (Risk Register).
- ensuring staff are aware of their responsibilities, and are provided with adequate information, instruction and training (induction, refresher and competency training);
- encouraging the reporting of hazards and taking appropriate actions when hazards are reported (Incident Reporting).
- maintaining workplace inspections and the assurance that corrective actions are implemented.
- ensuring all hazardous activities are risk assessed before commencing.

When is a Risk Assessment Required?

The hazard identification process must be undertaken for all activities at the University where there is a potential for health and safety risks, including:

- when planning or proposing to change personnel, work processes, events and other activities.
- before setting up and using a workplace.
- when planning changes to the workplace, such as new construction, alterations or renovations, repairs and maintenance.
- when designing, operating, maintaining, selling or disposing of plant or equipment.
- before purchasing, hiring, leasing, commissioning or erecting plant or equipment.
- before making, using and disposing of hazardous chemicals.

- whenever new information becomes available regarding work processes, plant and equipment, and hazardous chemicals.
- when responding to workplace incidents (even if they have caused no injury).
- when responding to concerns raised by workers, health and safety representatives and others at the workplace.
- when entering into partnerships, contracts and tenancies.
- whenever changes are made to the workplace, system or method of work, plant and hazardous chemicals used.

Identifying Hazards

Hazards and hazardous jobs can be identified by:

- reviewing incident reports and records to find out what has gone wrong in the past and could be problematic in future.
- observing work activities to see whether safety precautions are in place and being used correctly, or whether the people involved are at risk of injury.
- asking staff and students to raise work health and safety matters during regular discussions eg. during work group meetings (formal or informal). This might include discussion of recent incidents, maintenance issues, suggested improvements etc.
- reviewing standard operating procedures to ensure that safety aspects have been satisfactorily addressed.
- referring to labels, instructions and literature that relates to a particular workplace or activity. These may contain information about particular hazards and how the associated risks can best be managed. Typical literature includes operator manuals, safety data sheets, industry bulletins, journals etc.
- observing indicators such as high absentee rates, low morale, conflict between employees, ill-health, fatigue and poor work quality. These may signify that work demands are beyond the capacity of the workers.

Risk Register

All identified hazards must be recorded on the Faculty/Portfolio/Division OHS Risk Register (for general hazards), Plant Register (for all Plant) or Hazardous Chemicals Register (for hazardous chemicals, dangerous goods and/or controlled substances).

Definitions

Hazard:- A hazard is any situation, substance, activity, event or environment that could potentially cause an injury or illness.

Risk:- Risk is the likelihood of injury or harm resulting from exposure to a hazard.

Risk Assessment:- The process consists the steps under the Minimum Compliance Requirements section. This needs to be supported by communication and consultation as well as monitoring of controls and review of their effectiveness.

Legislative requirements under the OHS Act for managing risk

The principles of health and safety protection:-

1. The importance of health and safety requires that employees, other persons at work and members of the public be given the highest level of protection against risks to their health and safety that is reasonably practicable in the circumstances.
2. Persons who control or manage matters that give rise or may give rise to risks to health or safety are responsible for eliminating or reducing those risks so far as is reasonably practicable.

    - ✓ To avoid doubt, for the purposes of this Part and the regulations, regard must be had to the following matters in determining what is (or was at a particular time)

reasonably practicable in relation to ensuring health and safety—

a. the likelihood of the hazard or risk concerned eventuating;
b. the degree of harm that would result if the hazard or risk eventuated;
c. what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk;
d. the availability and suitability of ways to eliminate or reduce the hazard or risk;

Responsibilities

As stated in the OHS Responsibilities section of the OHS Manual, all managers have a responsibility to actively manage the OHS risks in their area. In addition all staff members have responsibilities to keep their work spaces safe, not expose themselves, a colleague, a student or any other person to risk of harm and report health and safety hazards.

Self-Check -2	Written Test

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

Fill the blank space

1. Mention risk assessment steps! (6%)

_____,_____

_____,_____

2 .When will a risk assessment required? (4%)

_____,_____

_____,_____

3. _____is any situation, substance, activity, event or environment that could potentially cause an injury or illness. (1.5%)

4. _____ is the likelihood of injury or harm resulting from exposure to a hazard.(1.5%)

5 _____ the process that consists the steps under the Minimum Compliance Requirements section.(2%)

Answer the following question!

Note: **Satisfactory rating - 8 and 15 points Unsatisfactory - below 8 and 15 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

Information Sheet 3. Implementing safety hazards

1.3. Implementing safety hazards

Establishing a safety and health program at your job site is one of the most effective ways of protecting your most valuable asset: your workers. Losing workers to injury or illness, even for a short time, can cause significant disruption and cost—to you as well as the workers and their families. It can also damage workplace morale, productivity, turnover, and reputation.

Safety and health programs foster a proactive approach to “finding and fixing” job site hazards before they can cause injury or illness. Rather than reacting to an incident, management and workers collaborate to identify and solve issues before they occur. This collaboration builds trust, enhances communication, and often leads to other business improvements.

THE BENEFITS OF IMPLEMENTING THESE RECOMMENDED PRACTICES

Responsible employers know that the main goal of a safety and health program is to prevent work-related injuries, illnesses, and deaths, as well as the suffering and financial hardship these events can cause for workers, their families, and their employers.

Employers may find that implementing these recommended practices brings other benefits as well. The renewed or enhanced commitment to safety and health and the cooperative atmosphere between employers and workers have been linked to:

- Improvements in production and quality .
- Better employee morale.
- Improved employee recruiting and retention.
- A more favorable image and reputation (among customers, suppliers, and the community).

Implementing a safety & health program

Each section of the recommended practices describes a core program element (see page 7), followed by several action items. Each action item is an example of steps that general contractors, subcontractors, managers, supervisors, and workers can take to establish, implement, maintain, and improve safety and health programs.

A general self-evaluation tool can be found on the recommended practices Web page. It can be tailored to your construction site to track your progress and document how you have implemented (or will implement) each action item.

NINE EASY THINGS TO GET YOUR PROGRAM STARTED

If these recommended practices appear challenging, here are some simple steps you can take to get started. Completing these steps will give you a solid base from which to take on some of the more structured actions presented in the recommended practices.

1. ALWAYS SET SAFETY AND HEALTH AS THE TOP PRIORITY

   Tell your workers that making sure they finish the day and go home safely is the way you do business. Assure them that you will work with them to find and fix any hazards that could injure them or make them sick.

2. LEAD BY EXAMPLE

Practice safe behaviors yourself and make safety part of your daily conversations with workers.

3. IMPLEMENT A REPORTING SYSTEM

   Develop and communicate a simple procedure for workers to report any injuries, illnesses, incidents (including near misses/close calls), hazards, or safety and health concerns without fear of retaliation. Include an option for reporting hazards or concerns anonymously.

4. PROVIDE TRAINING

   Train workers on how to identify and control hazards using, for example, OSHA's Hazard Identification Training Tool.

5. CONDUCT INSPECTIONS

   Inspect the job site with workers and ask them to identify any activity, piece of equipment, or material that concerns them. Use checklists and other resources, such as OSHA's Construction Industry Digest, to help identify problems.

6. COLLECT HAZARD CONTROL IDEAS

   Talk with workers about ideas on safety improvements throughout the project.

7. . IMPLEMENT HAZARD CONTROLS

   Assign workers the task of choosing, implementing, and evaluating the solutions.

8. ADDRESS EMERGENCIES

   Identify foreseeable emergency scenarios and develop instructions on what to do in each case. Meet to discuss these procedures and post them in a visible location at the job site.

9. MAKE IMPROVEMENTS

   Set aside a regular time to discuss safety and health issues, with the goal of identifying ways to improve the program.

How to accomplish it

- Identify a frontline person or persons who will lead the safety program effort, make plans, coordinate activities, and track progress. Define and regularly communicate responsibilities and authorities for implementing and maintaining the program, and hold people accountable for performance.
- Provide positive recognition for meeting or exceeding safety and health goals aimed at preventing injury and illness (e.g., reporting close calls/near misses, attending training, conducting inspections).
- • Establish ways for management and all workers to communicate freely and often about safety and health issues, without fear of retaliation.

IN AN EFFECTIVE safety and health program, all workers:

- Are encouraged to participate in the program and feel comfortable providing input and reporting safety or health concerns.
- Have access to information they need to participate effectively in the program.
- Have opportunities to participate in all phases of program design and implementation.
- Do not experience retaliation when they raise safety and health concerns; report injuries, illnesses, and hazards; participate in the program; or exercise safety and health rights.

Self-Check 3	Written Test

Directions: Answer all the questions listed below.

I. Answer the following questions by saying True or False. **(each 1.5 point)**

1. All workers are encouraged to participate in the health and safety program.
2. If injuries happened in our organization, we should refrain ourselves from reporting.
3. We should not always set safety and health as the top priority.
4. Responsible employers know that the main goal of safety and health program is to prevent work related injuries, illness and death.
5. Establishing a safety and health program at your job site is not one of the most effective ways of protecting your most valuable asset.

Note: **Satisfactory rating - 4 and 7.5 points** **Unsatisfactory - below 4 and 7.5points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Information Sheet 4- Consulting appropriate personnel.

1.4. Consulting appropriate personnel.

BENEFITS OF HIRING A SAFETY CONSULTANT

1. An increase in employee safety knowledge hiring a safety consultant allows employees to be fully aware of what can happen in their workplace if they are not careful. When employees are informed about the safety practices they need to follow, they are less likely to be hurt while on the job.
2. We are current on the latest safety regulations. Safety regulations can change over time. When employees are current in their safety knowledge, they will understand how to take any necessary preventive actions to avoid being hurt at work.
3. We know what it takes to comply with regulation. Every workplace doing business nowadays needs to completely comply with government rules and regulations. Because these rules and regulations can sometimes be difficult to understand, hiring a safety consultant makes it easy for employees to understand the rules and regulations they must comply with to remain safe in the workplace.
4. It costs less than hiring another employee While some workplaces will hire another employee to oversee workplace safety, it often costs less to hire a professional workplace safety consultant.
5. Workplace safety improves the bottom line. The fewer accidents a workplace experiences, the higher its chances of improving its bottom line. When employees are educated on workplace safety, they are less likely to have an accident. Fewer workplace accidents often lead to a lower insurance premium, which can save a business hundred or even thousands of Riyals every year.

   Three key areas that will be covered include:-

   - How safety consultants minimize workplace injuries in high-risk industries
   - Ways consultants put workers' safety at the forefront of business processes
   - Three ways safety consultants help businesses reduce workplace injuries:

- ✓ Identify compliance issues
- ✓ Identify gaps in training
- ✓ Identify safety gaps in processes

By understanding these three components, you'll learn the importance of engaging a safety consultant and how they help your business reduce workplace injuries.

Common reasons businesses invest in safety consultants include:

- Evaluating whether workplace processes and procedures comply with relevant regulations and legislation.
- Ensuring management and workers understand and comply with safety requirements. This includes Workplace Health and Safety (WHS), Occupational Health and Safety (OHS) and Environmental laws.
- Identify potential risks and hazards in the workplace. This includes worksite safety, equipment use and hazardous materials.
- Identify health and safety activities are properly documented.

Safety consultants aren't mandatory, however, they provide professional and experienced advice to reduce workplace injuries.

Safety consultants put workers' safety at the forefront of business processes

Safety in the workplace is non-negotiable. A safety consultant's primary responsibility is to inspect the workplace and ensure legal compliance. This includes Workplace Health and Safety (WHS), Occupational Health and Safety (OHS) and Environmental laws.

Depending on the contract, safety consultants may conduct multiple audits each year to identify any safety gaps in processes.

Business basics puts workers safety at the forefront of business operations. We offer several different types of workplace safety audits including:

- general safety audits
- site safety audits
- project audits

- contractor and supplier safety audits

Once safety gaps are identified, the consultant can provide advice and help create processes to prevent risks from arising. Next, we'll discuss how consultants can reduce workplace injuries.

Safety consultants help mitigate risks and create a safe work environment for your valuable staff & clients. Once the consultant has conducted a workplace safety audit, they will work with you to develop a process to fill in the gaps.

- **Identify compliance issues**
  Safety legislation is continuously evolving. A safety consultant will identify any OHS legal safety gaps your workplace needs to address. They could recommend your business becomes accredited or certified in a particular standard relevant to your business. For example, they may suggest your business becomes ISO 45001 certified to help prove your systems comply with OHS laws and the international standard.

- **Identify gaps in training**

The consultant will outline any gaps in safety training, working with you to create a safer process. For example, a safety resource manual may be developed for distribution during inductions.

Upskilling workers in safe workplace practices teaches them to respond to risks, reducing workplace injuries. Workplace safety also increases trust and morale. Therefore, workers are more likely to comply with processes and help ensure the workplace is safe.

- **Identify safety gaps in processes**

Audits identify gaps in workplace processes. Safety consultants may identify unsafe practices which contribute to the risk of potential injuries. By identifying risks in processes, the business is able to implement safety processes to reduce risks.

Take the proactive approach and reduce workplace injuries by engaging in a safety consultant. Avoiding unnecessary risk is one of the simplest, smartest ways to save workers from avoidable injuries.

Self-Check -4	Written Test

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

I. Give short answer (each 3 points)

1. What are the benefits of hiring a safety and health appropriate personnel?
2. List down the 3 ways that a safety consultant help business reduce workplace injuries!
3. Write down the different types of safety audits!

Part II fill the blank space (each 2points)

1. Safety consultants may identify_____ practices which contribute to the risk of potential injuries.
2. Once safety gaps are identified, the_____ can provide advice and help creat processes to prevent risks from arising.

Answer the following question!

Note: **Satisfactory rating 7 and 13 points** **Unsatisfactory below 7 and 13 points**

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer Sheet

Name: _____ Date: _____

Information Sheet 5. identifying system operating parameters by reviewing

1.5. identifying system operating parameters by reviewing

1.5.1. System specification

1.5.2. Component technical data

1.5.1. System specification

A requirement specification is a documented requirement, or set of documented requirements, to be satisfied by a given material, design, product, service, etc. ... A data sheet describes the technical characteristics of an item or product, often published by a manufacturer to help people choose or use the products

making requirements' specifications with parameters

End users are very fond of reports, which they can use to get their information from Relatics and share it with others such as project staff or other parties. With the press of a button, you can generate a complete report, including a logo, specific corporate identity and information from Relatics.

In this article, we discuss techniques and tips for creating a report for a requirements specification. End users can personally determine the content with regard to parameters for status and source document.

A separate report part for parameters

In order to show various kinds of information in the requirements specification, it is useful to create different report parts in the report. Consider, for example, report parts with information (e.g. requirements) and report parts that contain report-specific components (such as images and project information).

The report part *Parameters* was created for the requirements specification. This ensures that the report is more manageable, because you can always find the parameters in the

same place. An additional advantage is that this makes it easy to show all chosen parameter values in the report.

Separate constraint queries for applied parameters

The report part *Requirements* shows the query in which all required metadata for the requirements have been configured. Normally, you would apply the parameters directly in the *Status* and *Document* nodes.

However, when you look at the query again later on, it is not always clear where the parameters were applied, and it often takes search time to find an applied parameter, especially with larger queries. That is why we recommend creating a separate constraint query for basically every parameter used in a query. For the requirement specification, this was done for both parameters.

When you want to apply a parameter to an element with an optional relation, you often run into problems. In the requirements specification, this affects the source document. When an end user chooses a parameter value for ‘, everything is fine. Only the requirements with a relation to the chosen document are reported.

The problem occurs when the end user does not choose a parameter value. The end user then expects all requirements to be reported, but unexpectedly finds that all requirements that are not related to a document are not included in the end result. This is because the constraint query acts as a mandatory relation. This can be solved using a special construction in the constraint of the *Requirement* node:

Applying a selection tree to a parameter

For the status and the source document, showing the parameter values as a list is most practical for end users. Some information is often shown as a tree in the end application – for example breakdown structures, such as the SBS, FBS and WBS.

The requirements specification can be expanded to include a parameter for a system object. This allows end users to limit the set of requirements to a chosen system object

that is related to a requirement. By simply selecting a selection tree for the possible values in the parameter section of the query, the parameter values are displayed in a tree when generating the requirements specification.

System Identification Toolbox

Create linear and nonlinear dynamic system models from measured input-output data

System Identification Toolbox™ provides MATLAB® functions, Simulink® blocks, and an app for constructing mathematical models of dynamic systems from measured input-output data. It lets you create and use models of dynamic systems not easily modeled from first principles or specifications. You can use time-domain and frequency-domain input-output data to identify continuous-time and discrete-time transfer functions, process models, and state-space models. The toolbox also provides algorithms for embedded online parameter estimation.

The toolbox provides identification techniques such as maximum likelihood, prediction-error minimization (PEM), and subspace system identification. To represent nonlinear system dynamics, you can estimate Hammerstein-Wiener models and nonlinear ARX models with wavelet network, tree-partition, and sigmoid network nonlinearities. The toolbox performs grey-box system identification for estimating parameters of a user-defined model. You can use the identified model for system response prediction and plant modeling in Simulink. The toolbox also supports time-series data modeling and time-series forecasting.

Here we'll try to understand and learn regarding how to perceive or recognize the details of a part in a given circuit diagram even if it's not supplied in the article.

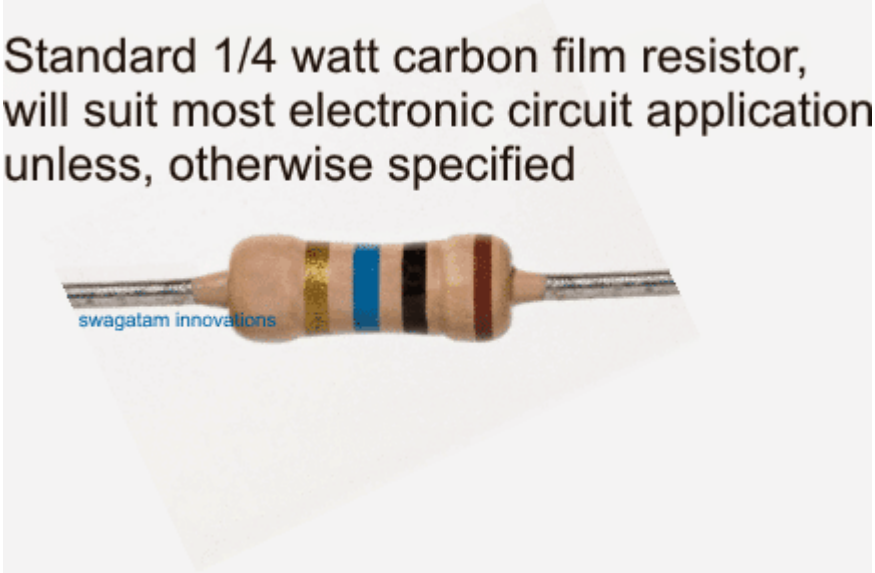
We'll begin with the resistors:

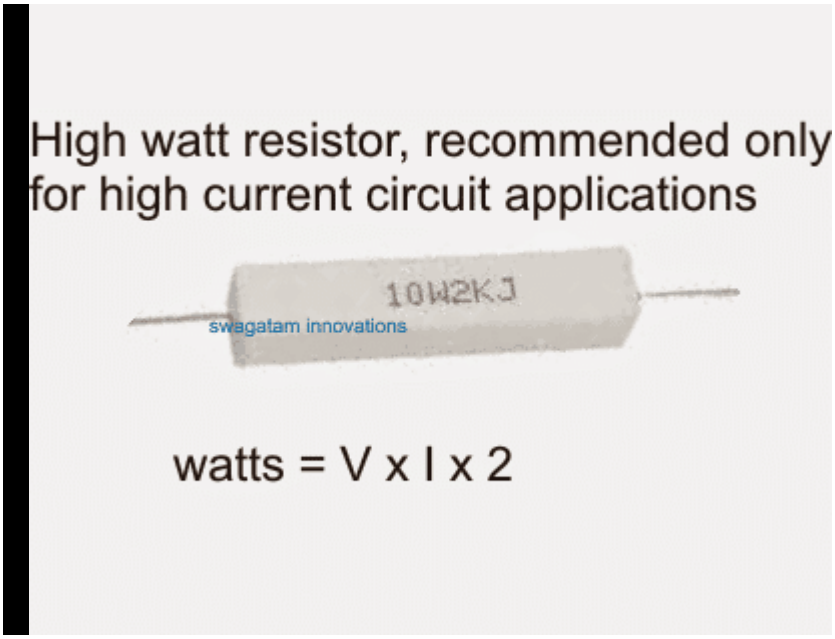
Identifying Resistors:

Resistors are the most primitive, basic, passive electronic components yet one of the most crucial members of the electronic family.

Whenever you come across a particular circuit diagram with no detailed resistor specifications mentioned (only values mentioned), you can certainly assume the resistors to be the default standard ones having the following specs:

Basically the watt parameter indicates how much current the resistor may safely handle for the given position in the circuit.





Now, after identifying the above specs, sometimes one may seem to be confused with the values too, for example the hobbyist may find the value 750K difficult to find in his locality, but there's nothing to worry about.

Resistor values are never too critical, so for the above example any value between 680K and 810K will mostly do the job, or the user may simply join a couple of odd resistors in series to achieve the same, accurately and efficiently (for example 470k + 270k will yield 740K)

Identifying Capacitors:

Capacitors are normally two types, i.e polar and non-polar. The examples of polar capacitors are electrolytic and tantalum, while for the non-polar the range can be quite large.

The non-polar capacitors could be the basic disc ceramic type, electrolytic type, polypropylene type, metallized polyester type.

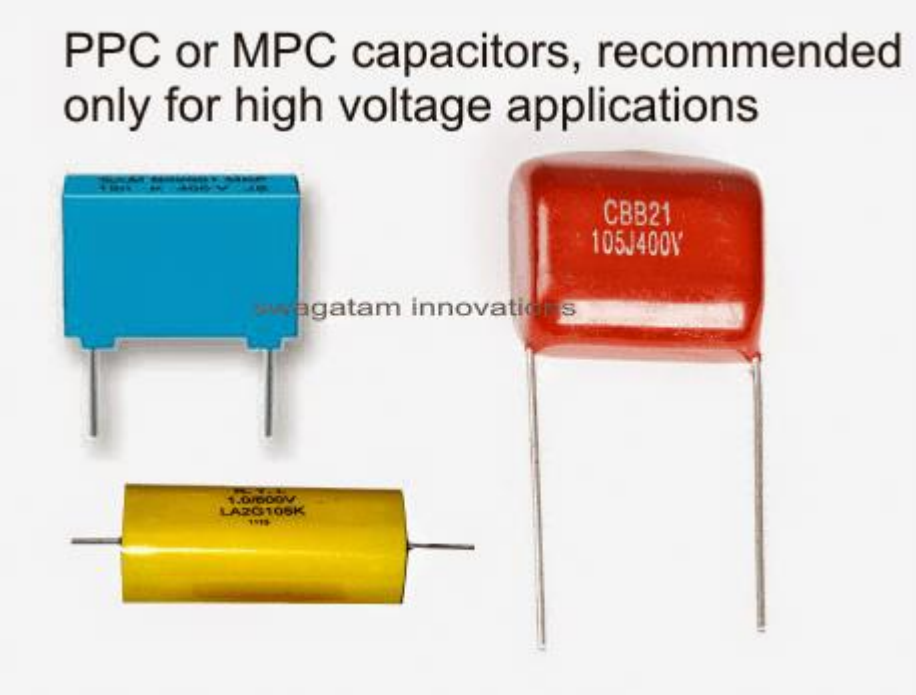
The voltage rating for the capacitors is important and as a rule of thumb, it should be twice that of the supply voltage spec of the circuit. Therefore, if the supply voltage is 12V, the typical voltage spec for the capacitors can be selected to be around 25V, higher than this parameter will never be harmful but is not recommended just because nobody would appreciate an unnecessary increase in the cost and space of the material.

If the diagram has not identified the "type" specifically, one can assume them to be having the following typical specifications:

Non-polar capacitors below 1uF can be assumed to be disc ceramic type of capacitors for most low voltage DC circuits, within 24V range.

For higher voltage circuits, one may need to specify the shopkeeper about the voltage rating of the capacitors, which must be as per the explained data in the above section.

Ceramic disc capacitor, suitable for all standard low voltage circuit applications, within 3V to 24V typically.....



For voltages at the mains level, the capacitor type should be always PPC or MPC, which stand for polypropylene or metallized polyester.

Electrolytic capacitors do not have any specific recommendation, these just need to fixed with the correct polarity and voltage rating to be maintained as per the previous discussion

In circuits which may demand extreme accuracy in terms of low leakage, for example in timer applications, one may opt for tantalum type of capacitors instead of the electrolytic counterparts which are designed to offer minimum possible leakage and high efficiency.

Identifying Diodes:

Diode specs can be easily identified in any circuit from the given data, since the part number itself will carry all the required info about it.

In a special case if you find it missing, you can assume the specs to be as per the following instructions:

If it's positioned in series with the supply voltage, for normal low current circuits a 1N4007 will do the job, which is rated to handle upto 1amp at 300V.

If the circuit is specified to work with higher currents, then a 1N5408 can be employed which is rated at 300V, 3 amps, a 6A4 may be selected for 5amp circuits....and so on.

For freewheeling applications such as in relays, a 1N4007 or 1N4148 can be used,

for higher current loads such as motors or solenoids the diode may be

appropriately upgraded as described above.

For higher current circuits the device the device simply needs to be upgraded with their amp specs.

If the diode is indicated as 1N4001, 1N4002 etc, simply ignore those and go for the ultimate 1N4007 variant, since its assigned for handling the maximum voltage in the range.

Same may be true for the other diodes too. Always refer to the datasheets of the particular series to learn which one in the range is the most advanced, in terms of voltage specs (not current, because current may be equal for all the diode in the series, for example 1N4001, 2, 3, 4....7 all are rated at 1 amp but with different voltage specs).

If the circuit is a high speed switching type circuit (like SMPS circuit), then the diode could be replaced with a Schottky type diode which are specified to work like fast switching fast recovery diodes. this variant too could be available from lowest to the highest current range, from which the matching device may be selected. Some examples of fast switching diodes are BA159, FR107 etc.

Identifying Transistors:

Transistors are one of the most important parts in an electronic circuit, and this too just like the above components can be customized as per the user's comfort.

Transistors are identified by their numbers which commonly end with a prefix, for example a BC547 may be available as BC547A, BC547B, BC547C etc.

If the circuit is a standard 12V operated one, in that case you can simply overlook the prefixes and just use any "BC547" transistors, however if the voltage spec of the circuit is on the higher side, then the prefix value should be taken into account, because the A,B,C endings indicate the maximum tolerable voltage limit for the device or their breakdown voltage limits. You may want to check out the datasheet of the particular device for identifying its exact voltage rating.

The second parameter which needs to be identified is the ampere (or mA) which can be again traced out from the datasheet of the particular device.

Therefore in an event a BJT number is not clearly specified in a circuit diagram, then the same can be identified by the above explained method, or if the shown number is obsolete and difficult to obtain, any other variant with a matching current and voltage spec can be used instead of the referred one.

The same may be true for mosfet and IGBTs.

Another factor that may become crucial while identifying transistors is their hFe value, however this can be ignored since all low signal BJTs are attributed with high gain or hFe values, so it's automatically taken care of.

So from the above discussion we can conclude that after all it's not so difficult to identify the correct and the safe working part specification for a given circuit, even if a detailed bill of material is not furnished along with it.

1.5.2. **Component Technical Data**

It is written by the manufacturers

Describes:-

- Performance characteristics
- Typical applications
- Limitations of a component

Though it may be adequate in some cases, a design where the components are chosen without giving due consideration to the information contained in the data sheet may not be the optimum one.

A device's datasheet reveals its true character and hence its suitability for a given application. In addition to listing the device parameters, it also gives the electrical and environmental conditions under which these parameters have been measured. It is vital information, particularly when the intended design has to meet stringent environmental requirements. Furthermore, a data sheet also contains information about important parameters as a function of other relevant electrical and environmental parameters. And in most cases, datasheets include some application circuits as recommended by the manufacturer.

To understand the data sheets of a device that one intends to use is a designer's imperative and not discretionary. Designers often consider knowledge of a few major specifications of the device as sufficient for the design exercise that they wish to undertake. It may be adequate in some cases, but the design where the components are chosen without giving due consideration to the information contained in the datasheet may not be the optimum one.

Datasheets: Common features

Knowledge of what all a comprehensive datasheet usually contains is essential in order to use it effectively for designing a circuit. The word comprehensive is used to here to

differentiate between the data sheet of a device found in a short form catalogue and another data sheet of the same device available in the detailed version. For example, a company manufacturing a range of semiconductor devices may have one condensed catalogue containing data on all categories of devices like diodes, bipolar transistors, MOSFETs, and thyristors that it manufactures. The company may also offer detailed catalogues separately for each of these categories.

All data sheets begin with a general description of the device. The information under this heading usually includes typical applications as suggested by the manufacturer, a summary of the outstanding features of the device and in some cases technological highlights of the device's architecture . Statements like, “It has high (dv/dt) capability and a low thermal resistance,” (taken from datasheet of S2800 series SCR), or “High photosensitivity, Hermetically sealed,” “Fast optical sensor of high modulation bandwidth,” (taken from the data sheet of PIN photodiode type BPX 65) (Figure 1), are representative of the first page of the datasheet of the device.

If you’ve worked with a component before and you’re very familiar with its specifications, you probably won’t need to read a datasheet. Whenever you’re comparing new components, or you need to know the limits of a new component, it’s critical that you scan through a datasheet to find the information you need. Some datasheets provide either far too much or far too little information. Whereas other documents ostensibly called “datasheets” are really technical briefs without sufficient information.

When you do find the datasheet you need for a new component, you may spend anywhere from minutes to hours learning important specification information. This is especially true if you need to create a footprint and 3D model from a datasheet. With the right component search service, you can cut down on the time you’ll spend studying datasheets and you can spend more time worrying about creating powerful PCBs for new products.

How to Read a Component Datasheet

The strategy for reading through a component datasheet depends on the type of component and the information you need to find. If you’re working with passives or ICs

with standardized packaging, you're probably less focused on footprints and more focused on electrical specifications.

A great datasheet will have the important electrical specifications you need summarized on the first page alongside packaging information. Some datasheets are nicely sectioned and include a clear table of contents, while others will cluster information into a datasheet with no clear organization.

the difference between specification and datasheet is that specification is specification while datasheet is a document summarizing the performance and other technical characteristics of a product.

Self-check-5	Written Test

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

I. Answer the following questions by saying True or False (each 1 point)

1. Capacitor and resister have the same system specification

2. Resisters have 2 polarities.

3. We can use capacitors without seeing their ratings.

4. Every electronic components has its own specifications.

5. To use electronic components first we have to look for their specification and technical data.

II. Short Answers (each 3points)

1. What is the difference between specification and technical data?
2. What is resistor?
3. How to identify a transistor?

Note: Satisfactory rating 8 and 14 points Unsatisfactory below 8 and 14 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Question

Information Sheet 6. Obtaining tools, equipment, applications, and testing devices needed for the work in accordance with established procedures and checking for correct operation and safety.

1.6. Obtaining tools, equipment, applications, and testing devices needed for the work in accordance with established procedures and checking for correct operation and safety.

Equipments

A vacuum Cleaner

Fig.1 Cleaning Vacuum operating on floor

Vacuum cleaning performance

You can't tell in the shop how well a vacuum actually cleans, which is where our expert tests come in. When testing vacuum cleaners, we let machines do the hard work by attaching them to custom-built test rigs and setting them to work on dust and grime. We run through a series of tests and ask tough questions of each vacuum cleaner to help calculate our final score. These include:

the vacuum clean fine dust from carpet and hard floors

For our carpet test, a machine spreads super-fine dust over a carpet and grinds it in. We then strap each vacuum cleaner into the rig, which pulls and pushes it back and forth five times as it sucks up the dust.

Each vacuum cleaner covers a distance of 288m in this test alone. The rig springs into action again to do a similar job for smooth and creviced wood floors. A bad vacuum cleaner picks up less than half of the dirt in the carpet, whereas a Best Buy can pick up twice as much. We conduct the same fine dust pick-up test on carpets, flat laminate floors and also crevices to simulate the gaps you find between floorboards.

The vacuum suck up larger bits of debris

But it's not just fine dust that you'll need to clean up at home, which is why we also challenge each vacuum to pick up larger debris. We use a large amount of dry lentils, spilled onto a flat laminate floor, to represent larger bits of dirt and spills in the home, and measure how much each vacuum cleaner can suck up. Some vacuum cleaners will just plough larger debris around in front of them rather than sucking it all into the machine.

Fig.2 Vacuum Cleaner operating in home

A powerful vacuum cleaner is no good if its suction diminishes as it gets full. To test this, we set each vacuum to work on our rig again, measuring the suction when bags or canisters are empty, and again when they're filled with dust and debris.
Many vacuum cleaners leak out some of the fine dust they suck up and leave a dusty residue behind, which can exacerbate symptoms for allergy sufferers. To uncover the models that keep fine dust safely locked away inside, we use specialist machinery to test how much dust and fine particles the vacuum cleaners retain.

To assess each vacuum cleaner's pet hair pick-up, we comb real cat and dog fur into an area of carpet and then time how long each vacuum cleaner takes to pick it up. Poor-scoring models can take more than three minutes, while the best clear it in less than 30 seconds.

Vacuum cleaner noise levels

You won't be able to tell in the shop just how noisy a model is - that's why we test the sound of each vacuum cleaner in a chamber in our lab. We've found noise levels vary dramatically, from 65 up to 90 decibels - that's the difference between the sound of conversation a metre away to the sound of a busy main road.

Polisher:- make the surface of (something) smooth and shiny by rubbing it

The Polishing Process:-

Polishing is one of the oldest processing methods, first used on the making of stone implements. Polishing is one finishing loose abrasive process, used to generate surfaces with very high tolerances in geometry, surface integrity, and roughness characteristics. It is still one of the most important finishing methods. Polishing particles remove small elements of a surface and make them smooth. This smoothness is obtained by rubbing the surface with the polishing particles with a rotating disk. Polishing is the best method today to obtain the finest surface. High accuracy and ultra-precision technology are indispensable ingredients for polishing today.

Polishing uses a larger number of multi point or random cutting edges for effective material removal. Abrasive finishing processes are accepted in a wide range of material applications and industries. Typical examples are finishing of various components used in aerospace, automotive, mechanical seals, fluid handling, and many others precision engineering industries.

Home Food Processing Equipment

Pressure and Rice Cooker

Fig.1 Pressure Cooker

operates automatically in the event of excess Do not use pressure cooker for other than intended use. Add the rest of the squash along with the ginger, nutmeg, and stock. See more ideas about microwave pressure cooker, pressure cooker recipes, pressure cooker. pressure cooker is used near children. We're including recipe instructions to suit your lifestyle.

Darn! One disadvantage of cooking with a pressure cooker is you can't inspect, taste, or adjust the food along the way. Okay, here goes a little Physics 101. However, you may halt the cooking by quickly reducing pressure and open the lid if necessary. Many businesses started manufacturing faulty pressure cookers fulfilling the soaring demand.

Extreme caution must be used when moving a pressure cooker containing hot liquids. Start typing to see results or hit ESC to close, Instant pot burn Message: why + how to fix it, 6 Instant pot steamer basket best sellers, close lid, ensure valve is at the correct position, electric pressure cookers: select cooking program and time, Stovetop pressure cookers: put on stovetop, select pressure setting, turn heat to high, wait for the pressure to build up inside the pot, electric pressure cookers: the screen will display the cook time countdown, Stovetop pressure cookers: turn heat to low and start timer using the required cook time, Tough cuts of meat – including beef, pork. At last, he ended his life to commit suicide. However, it's starting to have a big comeback because the new generation of pressure cookers are so much safer to use.

Add the onion, carrots, celery, parsnips, mushrooms, garlic and rosemary to the pressure cooker and sauté for 8 to 10 minutes.

Do not wash in a dishwasher.

Nowadays, you can even bake in your pressure cooker!

In the pressure cooker, with the top off, over medium heat soften onions with the sage, salt and pepper. When the pressure reaches the designed safety limit, the cooker will begin to simmer the food. When you heat up a pot, the liquid inside boils and turns into steam.

The temperature inside a pressure cooker can well go beyond 110° C, which reduces the time needed to cook food.

Blender, coffee maker

Fig.1 Blender,Coffee maker

Aluminium body with ABS plastic sides.

- Powerful Hp Motor - 24,000 Rpm - forced fan cooling.
- 2 Litres - 64 oz

• Flexible thermoplastic lid with built-in cup that allows operator to add ingredients during the blending process.

• Fitted with safety micro-switch on lid: the unit won't turn on if the lid is not correctly placed.

• Hardened stainless steel blade designed to increase blending speed and reduce blending time.

• Digital ON/OFF switch with no voltage release protection: the unit won't turn on after power failure .

• Pulse button and high (+) and low (-) speed pulse control add versatility to non-programmed blending.

• 4 buttons with 20 pre-programmed recipes to choose from + able to store up to 9 custom recipes.

• Thermoformed sound enclosure to reduce operating noise.

Roaster, waffle maker

Fig.1 Roaster, waffle maker

This hardworking Salter machine comes with three sets of interchangeable plates for waffles, paninis and sandwiches and outdid other multifunction machines in the texture

and taste stakes. It makes impressively large and deep waffles that were soft and light in the middle with a crunchy exterior.

The high hinge of the machine helps to create a uniform thickness, although the colour was a little uneven. The deep, wide plates can take lots of batter so we had to experiment with quantities to get it just right. The sandwich and panini plates are just as generously sized but were slightly trickier to remove than other brands we tested.

Given its versatility and generous portions, it is surprisingly compact, although it doesn't come with a storage solution so has to be packed away carefully to avoid scratches. However, there is a useful cable tidy and clips for keeping the plates secure when stacked. Read our full review of the Salter 3-in-1 snack maker.

The crust had a good crunch and the colour on the waffles was generally even, but we had to keep a close eye after 4-5 minutes of cooking to avoid overcooked patches.

Although there is no integrated timer so you have to check the old-fashioned way.

Microwave Oven

Fig.1 Microwave oven

When we cook, we have to heat something to eat with fire. But today, we can cook easily by using a microwave oven. Instead of heating food products, we just push the button. Though everyone knows how to use it, it is hard to find someone who knows how it works. Because of its name we just know that it uses microwaves.

Originally, microwaves were principally used for communication. In 1950, the use of microwave energy to heat materials was discovered. Now microwave ovens have became common for heating food products in the home.

The most prominent characteristic of microwave heating is volumetric heating, which is quite different from conventional heating where the heat must diffuse in from the surface of the material. Volumetric heating means that materials can absorb microwave energy directly and internally and convert it to heat. It is this characteristic that leads to advantages using microwaves to process materials. Now we present more detailed characteristics of microwave heating.

MICROWAVES

microwaves are a form of electromagnetic energy, like light waves or radio waves, and occupy a part of the electromagnetic spectrum. Microwaves are used to relay long-distance telephone signals, television programs and computer information across the earth or to a satellite in space. They are used to detecting speeding cars. Yet, the microwave is perhaps most familiar as the energy source for cooking food. All wave energy changes polarity from positive to negative with each cycle of the wave. In microwaves, these polarity changes happen millions of times every second.

Food molecules - especially the molecules of water - have a positive and negative end, in the same way a bar magnet has a north and a south pole. When microwaves at the right frequency bombard food, they cause the polar molecules to rotate at the same frequency, millions of times a second.

All this agitation on the molecular level creates friction, which heats up the food. Because microwaves don't interact with molecules of glass, plastic or paper, only the food is heated.

HOW A MICROWAVE OVEN WORKS

A microwave oven works as follows:

1. Electrical energy, in the form of low-voltage alternating current and high-voltage direct current, is transformed and converted into direct current.
2. A magnetron uses this direct current and generates microwaves with a frequency of 2450 megacycles per second or 2.45 GHz (gigahertz).
3. The microwaves are directed by an antenna at the top of the magnetron into a waveguide.
4. The waveguide channels microwaves to a fanlike device called a stirrer which disperses them inside the oven cavity.
5. The microwaves then reflect off the metal walls of the oven's interior and are absorbed by molecules in the food.
6. Because each wave has a positive and negative component, the molecules in the food are jostled back and forth at twice the rate of the microwave frequency, namely 4.9 billion times a second.

Microwave heating

The most prominent characteristic of microwave heating is volumetric heating, which is quite different from conventional heating where the heat must diffuse in from the surface of the material. Volumetric heating means that materials can absorb microwave energy directly and internally and convert it to heat. It is this characteristic that leads to advantages using microwaves to process materials.

Electronic Clock

Fig.1 Electronic Clock

YSZ-4 four electronic clock, it uses an AT89C2051 as its core, a total of 16 electronic components to create a clock with hours/minutes or minutes/seconds, two independent alarms, (8:00 -20:00) hourly chime, accurate adjustment, and other functions.

Operation instructions It will display 12:59 when Power-on, while is normal interface ("hours:minutes"). The both channels of the alarm clock are opened. At the same time, the first alarm clock has been set at 13:01.the second alarm clock has been set at 13:02. After power on, short press S2.The display of digital tube will switch between "hours:minutes" and "minutes:seconds". Long press S1 to enter the system Settings menu. There are A, 8, C, 0, E, F, G, H, I submenus. Short press S1 to cycle through the submenus, and finally back to the normal display.

A. **Sub menu**: Correction for hours

Display data will add 1 with each press of S2. When done adjusting the A Submenu, short press S1 to save the setting, quit the A submenu, and enter the B submenu.

B. **Sub menu**: Correction for minutes

Display data will add 1 with each press of S2. When done adjusting the B Submenu, short press S1 to save the setting, quit the B submenu, and enter the C submenu.

C. Sub menu: on time alarm switch

The default state is ON (on-time-alarm is open from 8:00 to 20:00) It will switch between ON and OFF (hourly alarm is disabled) with each press of S2. Short press S1 to save the setting, quit the C submenu, and enter the D submenu.

D. Submenu: The first alarm-clock switch

The default state is ON (the first alarm-clock is opened) It will switch between ON and OFF (first-alarm-clock is closed) when press S2。 If set to ON, short press S1 to save and quit, then enter E submenu; If set to OFF, short press S1 to save and quit, then enter G submenu;

E. Sub menu: The first alarm clock set for hours

Display data will add 1 with each press of S2. When done adjusting the E submenu, a short press of S1 will save the setting, quit the E submenu, and enter the F submenu.

F. Sub menu: The first alarm clock set for minutes

Display data will add 1 with each press of S2. When done adjusting the F Submenu, a short press of S1 will save the setting, quit the F submenu, and enter the G submenu.

G. Submenu: The Second alarm-clock switch

The default state is ON (the second alarm-clock is enableded) It will switch between ON and OFF (second-alarm-clock is closed) when S2 is pressed. If set to ON, short press S1 to save/quit, and enter H submenu; If set to OFF, short press S1 to save/quit, and enter normal interface;

H. Sub menu: The second alarm clock set for hours

Display data will add 1 after each press of S2. When done setting the F Submenu, a short press of S1 will save the setting, quit the H submenu, and enter the I submenu.

I. Sub menu: The second alarm clock set for hours

Display data will add 1 after each press of S2. When done setting the I Submenu, a short press of S1 will save the setting, quit the H submenu, and enter the normal interface.

Flat irons and presses

Fig.1 Flat Irons and Presses

Ironing is the use of a machine, usually a heated tool (an iron), to remove wrinkles from fabric. The heating is commonly done to a temperature of 180–220 °Celsius (356-428 Fahrenheit), depending on the fabric. Ironing works by loosening the bonds between the long-chain polymer molecules in the fibers of the material.

While the molecules are hot, the fibers are straightened by the weight of the iron, and they hold their new shape as they cool. Some fabrics, such as cotton, require the addition of water to loosen the intermolecular bonds. Many modern fabrics (developed in or after the mid-twentieth century) are advertised as needing little or no ironing. Permanent press clothing was developed to reduce the ironing necessary by combining wrinkle-resistant polyester with cotton. Recommended ironing temperatures

Recommended ironing temperatures

Textile	Temperature[*citation needed*]	Temperature[2]	Dot mark
Toile	240 °C		
Triacetate ("Estron", "Silene", "Tricell")	200 °C	220–250 °C	
Cotton	204 °C / 400 °F	180–220 °C	* * * [9]
Linen (flax)	230 °C / 445 °F	215–240 °C	* * * [9]
Viscose/Rayon	190 °C	150–180 °C	* * [9]
Wool	148 °C / 300 °F	160–170 °C	* * [10]
Polyester	148 °C / 300 °F		* [9]
Silk	148 °C / 300 °F	140–165 °C	* [10]
SympaTex			* [9]
Acetate ("Arnel", "Celco", "Dicel")	143 °C	180 °C	* [10]
Acrylic	135 °C	180 °C	
Lycra/spandex	135 °C		
Nylon-6	150 °C	150 °C	*
Nylon-66	170 °C	180–220 °C	***

Dot mark	Temperature
*	< 110 °C
* *	< 150 °C
* * *	< 200 °C

Rechargeable Light

A. Rechargeable Torch

Fig.1 Rechargeable Light

Features & Benefits:

- High power LED for outstanding light output.
- Compact and lightweight ergonomic torch design.
- Two power levels of light output give up to 6.5 hours light duration.
- Rechargeable battery with low power indicator.
- Supplied with wrist strap and clip ring.
- Emergency illumination function.

- Mains and vehicle charger options.
- Very low maintenance, quick and easy parts replacement.

The torch is low maintenance with quick and easy parts replacement, a full spares service is offered for all internal/external fittings, and the LED light source is expected to last the product's lifetime.

Vehicle and mains voltage charger options offer a rapid recharge time of only 1.5hrs for 90% capacity, plus the mountable ‘quick’ charger is configured.

Rechargeable LED Work Light

Fig.2 Rechargeable Light

WARNING: To reduce the risk of fire, electric shock or personal injury.

- Always unplug the charger/adaptor from light and power source when not in use.
- Do not look directly at the lighted lamps to avoid eye injuries.
- Always keep the work light away from any flammable surface or materials.
- Always check damaged or worn-out parts before using the work light. Broken parts will affect the work light operation. Replace or repair damaged or worn parts immediately. If repairs are needed, consult a professional electrician.
- Do not use a pressure washer to clean this product.

- Do not modify the work light in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the product. There are specific applications for which the work light was designed.
- Store work light in a secure place out of the reach of children. Inspect it for good working condition prior to storage and before re-use.

This rechargeable work light is shipped with the battery partially charged. Charge the work light after purchase and before the first use by using the 120V AC charger (12) for 3-5 hours or until the battery charge indicator turns green.

Charging/Recharging Using the 120V AC Charger

1. Make sure the work light is turned off
2. Connect the 120V AC power charger and the charging port
3. Plug the AC charger into a standard 120V/60Hz power outlet to start charging. A lit red "Power Smith" logo (A) indicates the charging is in progress. The "Power Smith" logo turns green when the charging is completed.

Charging/Recharging Using the 12V DC Car Charger

1. Make sure the work light is off
2. Connect the 12V DC charger (13) and the work light
3. Insert the 12V DC plug into the accessory outlet of a vehicle or other 12 volt DC power outlet to start charging. A lit red "Power Smith" logo (A) indicates the charging is in progress. The "Power Smith" logo turns green when the charging is completed.

USB OUTPUT

Your work light has a USB output (9). You may use it to charge other portable devices using a USB cable (not included).

Note:- The USB port is for power output only and cannot be used to charge the light.

Electronic controlled Light

Fig.1 Electronic Controlled Light

Remote control lights can be simple. Representing the lowest barrier to entry, plug-in devices connect your lamp and the wall outlet, functioning as a remote control for the attached light.

New technology even allows you to connect to your smartphone, Google Home, and Alexa. You leave to work, you leave the switch on your lamp permanently in the On position - the plug-in module will deal with turning the lamp on and off.

In just a few moments, control a few lamps in your living room, bedroom or any location where your light fixtures plug into a power outlet. You can control it from anywhere in the world.

Remote control lights do not mean you are pressing a remote control to turn your lights off and on, although you can. It's far more than that. Remote control lights is like having the ability to control and access your home from anywhere in the world using a smartphone, laptop, Apple Watch, Siri, and other voice assistants. Remote control lights can be simple.

Even if you are home and not at a "remote location" you can access your smart home products with a simple integration process.

If your lamps use dimmable bulbs, a plug-in dimmer module lets you not only control if the light is on or off, but the brightness, too. Do check your bulbs, though, as many CFL and LED bulbs are not compatible with dimmers.

Most bulbs purchased today are not inherently compatible with dimmers. Chances are, if you use CFL or LED bulbs, an On/Off Module would be a better choice. You won't get nifty dimming features but you also won't have to replace all of your bulbs.

Remote Control Appliances

A remote control (RC) is a small, usually hand-held, electronic device for controlling another device, such as a television, radio or audio/video recording device. Remote controls commonly operates via infrared signals but sometimes by radio frequency signals.

Techopedia explains *Remote Control (RC)*

The technology behind remote control devices has been around for more than a century. In 1898, Nikola Tesla developed and patented a "Method of an Apparatus for Controlling Mechanism of Moving Vehicle or Vehicles" and publicly demonstrated his method by operating a remote controlled boat in Madison Square Garden at an electrical exhibition.

In 1939, a low-frequency, battery-operated radio transmitter, the Philco Mystery Control, became the first wireless remote control for consumer electronic devices. In 1950, Zenith Radio Corporation invented the first television remote control. It was called Lazy Bones, and used a wire to connect to the TV.

Most remote control of electronic appliances is done by infrared signals using an infrared diode that emits an invisible beam of light, typically a 940 nanometer wavelength LED. Multichannel remote controls use sophisticated technology to modulate carrier signals, demodulate the received signals, and use a variety of frequency filters to separate signals for various remote control functions. However, these

infrared signals need to be in line of sight to operate the device, and may be reflected by mirrors as would any other light source.

Some remote control is done by radio frequency signals. These do not require line of sight to the device being controlled. They can be focused in one direction, or be multidirectional. Radio frequency remote control is widely used in such applications as garage door openers, automatic barrier control, burglar alarms and wireless home alarm systems.

Photo copy machine

How Photocopiers Work

Walk into almost any business office, and you'll probably find a photocopier ("copier") with a line of people waiting to use it. For most businesses, small or large, the copier has become standard equipment, much like having a desk to work at and a chair to sit in.

Fig.1 A photo copier Machine

What if you had to resort to making carbon copies of important documents, as many people did before copiers came along? Or worse, imagine how tedious it would be if you

had to recopy everything by hand! Most of us don't think about what's going on inside a copier while we wait for copies to shoot neatly out into the paper tray, but it's pretty amazing to think that, in mere seconds, you can produce an exact replica of what's on a sheet of paper!

The Basics:-

The human-end of making a copy begins with a few basic steps:

- Open the copier lid
- Place the document to be photocopied face-down on the glass
- Select the options you want (number of pages, enlargements, lighter/darker)
- Press the Start button

What happens inside the copier at this point is amazing! At its heart, a copier works because of one basic physical principle: opposite charges attract.

As a kid, you probably played with static electricity and balloons. On a dry winter day, you can rub a balloon on your sweater and create enough static electricity in the balloon to create a noticeable force. For example, a balloon charged with static electricity will attract small bits of paper or particles of sugar very easily.

A copier uses a similar process.

- Inside a copier there is a special drum. The drum acts a lot like a balloon -- you can charge it with a form of static electricity.
- Inside the copier there is also a very fine black powder known as toner. The drum, charged with static electricity, can attract the toner particles

There are three things about the drum and the toner that let a copier perform its magic:

- The drum can be selectively charged, so that only parts of it attract toner. In a copier, you make an "image" -- in static electricity -- on the surface of the drum. Where the original sheet of paper is black, you create static electricity on the drum. Where it is white you do not. What you want is for

the white areas of the original sheet of paper to NOT attract toner. The way this selectivity is accomplished in a copier is with light -- this is why it's called a photocopier!

- Somehow the toner has to get onto the drum and then onto a sheet of paper. The drum selectively attracts toner. Then the sheet of paper gets charged with static electricity and it pulls the toner off the drum.
- The toner is heat sensitive, so the loose toner particles are attached (fused) to the paper with heat as soon as they come off the drum.

The drum, or belt, is made out of photoconductive material. Here are the actual steps involved in making a photocopy:

- The surface of the drum is charged.
- An intense beam of light moves across the paper that you have placed on the copier's glass surface. Light is reflected from white areas of the paper and strikes the drum below.
- Wherever a photon of light hits, electrons are emitted from the photoconductive atoms in the drum and neutralize the positive charges above. Dark areas on the original (such as pictures or text) do not reflect light onto the drum, leaving regions of positive charges on the drum's surface.
- Negatively charged, dry, black pigment called toner is then spread over the surface of the drum, and the pigment particles adhere to the positive charges that remain.
- A positively charged sheet of paper then passes over the surface of the drum, attracting the beads of toner away from it.
- The paper is then heated and pressed to fuse the image formed by the toner to the paper's surface. This diagram helps see the process:

When the copier illuminates the sheet of paper on the glass surface of a copier, a pattern of the image is projected onto the positively charged photoreceptive drum below. Light reflected from blank areas on the page hits the drum and causes the charged

particles coating the drum's surface to be neutralized. This leaves positive charges only where there are dark areas on the paper that did not reflect light. These positive charges attract negatively charged toner. The toner is then transferred and fused to a positively charged sheet of paper.

Inside a Photocopier

If you take a photocopier apart, you might be overwhelmed by how many different parts there are. However, the actual photocopying process relies on only a few, key pieces:

- Photoreceptor drum (or belt)
- Corona wires
- Lamp and lenses
- Toner
- Fuser

Photoreceptor Drum

The photoreceptor drum (or, in some photocopiers, belt) is the heart of the system. A drum is basically a metal roller covered by a layer of photoconductive material. This layer is made out of a semiconductor such as selenium, germanium or silicon.

What makes elements like selenium so cool is that they can conduct electricity in some cases, but not in others. In the dark, the photoconductive layer on the drum acts as an insulator, resisting the flow of electrons from one atom to another.

But when the layer is hit by light, the energy of the photons liberates electrons and allows current to pass through! These newly freed electrons are what neutralizes the positive charge coating the drum to form the latent image.

It's easy to imagine how you might project a copy of an image on a photoreceptive belt that has roughly the same dimensions as the sheet of paper containing the image. A problem emerges when you think about doing the same thing on a thin, cylindrical drum.

How can the surface area of the drum possibly match the real estate on a sheet of paper? The solution is to simply rotate the drum while you're making a copy. If you rotate the drum in lockstep with the movement of the light beam across the original document, you can build the image strip by strip.

After one strip of light is focused onto a corresponding swath of the drum, the drum rotates to expose a fresh area of the photoconductor. Meanwhile, the previously exposed region of the drum swings into contact with the toner, and then with the paper.

Because the length of a standard printed page is a lot larger than the circumference of the drum in a modern photocopier, one full rotation of the drum will only replicate a small piece of the page. The drum actually has to be cleaned, recharged with ions, exposed to photons, and sprinkled with toner multiple times in order to duplicate the entire original. To the casual observer, the process appears continuous, because it's all seamlessly coordinated inside the photocopier as the drum rotates.

Fig.1 Photoreceptor Drum

Corona Wires

For a photocopier to work, a field of positive charges must be generated on the surface of both the drum and the copy paper. These tasks are accomplished by the corona wires. These wires are subjected to a high voltage, which they subsequently transfer to the drum and paper in the form of static electricity.

The corona wire uses static electricity to coat both the photoreceptive drum and the copy paper with a layer of positively charged ions.

One of these wires is stretched parallel to the drum surface and charges the photoconductive surface with positive ions, and the other wire is positioned to coat the paper's surface as the paper shoots by on its way to the drum.

Fig.1 Corona Wires

Lamp and Lenses

Making a photocopy requires a light source with enough energy to boot electrons out of the photoconductive atoms. What wavelengths of light can do this? It turns out that most of the visible spectrum of light contains enough energy to drive the process, especially the green and blue end of the spectrum.

Anything lower than the red portion of the visible spectrum doesn't have enough gusto to activate the photoconductor. And, although UV light has more than enough firepower to make a photocopy, it can be very damaging to our eyes and skin. This is why photocopiers use a plain old incandescent or fluorescent bulb to flash light onto the original document.

When the lamp in the copier is turned on, it moves across the inside of the copier, illuminating one strip of the paper at a time. A mirror attached to the lamp assembly directs reflected light through a lens onto the rotating drum below. The lens works just

like the one on your camera. It allows you to focus a copy of the image in a specific place. Although you can't really focus the image on a photocopier to make the final product more or less blurry, you can change the distance between the lens and the original or between the lens and drum to either reduce or magnify the size of the original image on your copy.

Fig.1 Lamp and Lenses of Photocopier

Toner

Toner is sometimes referred to as dry ink, but toner isn't actually ink at all! Ink is a pigmented liquid. Toner is a fine, negatively charged, plastic-based powder. The black color in photocopier toner comes from pigments blended into the plastic particles while they are being made.

In your photocopier, toner is stuck on larger, positively charged beads and stored inside a toner cartridge. When toner-coated beads are rolled over the drum, the toner particles find the positively charged ions on the unexposed areas on the drum's surface much more attractive than the weakly charged bead.

The same particles are subsequently even more drawn to the electrostatically charged paper. The plastic in the toner lets you keep it from jumping ship once you've finally got it on the paper; all you have to do is apply heat to the toner, and the plastic particles melt and fuse the pigment to the paper.

Fig.1 Tuner

The Fuser

The fuser provides the finishing touches that make the toner image on a sheet of paper permanent. The fuser has to do two things:

- Melt and press the toner image into the paper
- Prevent the melted toner and/or the paper from sticking to the fuser

All that's required to accomplish these tasks is quartz tube lamps and Teflon-coated rollers. The sheet of paper is sent between two of the rollers. Then, the rollers gently press down on the page to embed the toner in the paper fiber. Meanwhile, inside the rollers, the lamps are on, generating enough heat to melt the toner. Why doesn't the toner melt onto the rollers instead? Just like non-stick coating prevents your dinner from becoming glued to the bottom of your frying pan, the Teflon coating the rollers keeps the toner and paper from sticking to them.

Putting It All Together

In a photocopier, the light-induced conductivity of the drum is exploited to create a latent image in the form of electrical charges on the surface of the drum. This image is made visible and transferred to paper using a special, charged toner.

Here's how it all comes together to make a copy:

1. For the photocopier to work its magic, the surface of the photoconductive material must first be coated with a layer of positively charged ions by the corona wire.
2. When you hit the Start button, a strong lamp moves across the inside of the copier and casts light onto the paper you're copying, and the drum starts to rotate. As light reflects off of blank areas of the paper, mirrors direct it through onto the drum surface.

   Like dark clothing on a hot sunny day, the dark areas of the original absorb the light, and the corresponding areas on the drum's surface are not illuminated.

3. In the places that light strikes the rotating drum, the energy of the photons kicks electrons away from the photoconductive atoms.
4. Opposites attract -- the positively charged ions coating the photoconductive layer attract the freed electrons. The marriage of one ion and one electron produces a neutral particle. Charged particles remain only in places where light didn't hit the drum because it wasn't reflected from the original -- the dark spaces taken up by text and pictures on the page!

This part of the process loosely resembles how a camera takes a picture. If you've read How Photographic Film Works, you know that when film is exposed to light, the energy of the photons causes chemical changes in the silver halide grains coating the film. This creates a negative image of what you see through the viewfinder. With a photocopier, however, you end up with a real image created from a pattern of positive charges left after exposure to light. And while you have to develop film using special chemical processes and print it on light-sensitive photographic paper, the photocopier produces a visible image with only dry ink, heat and regular paper.

5. Voltage is applied to the aluminum core of the drum. Since light renders selenium conductive, current can flow through the

photoconductive layer while the drum is being illuminated, and the electrons released by the atoms are quickly replaced by the electrons that form the current flowing through the drum.

6. The exposed areas of the drum rotate past rollers encrusted with beads of toner. Tiny particles of toner are pressed against the drum's surface. The plastic-based toner particles have a negative charge and are attracted to areas of positive charges that remain on the drum's surface.
7. The corona wire passes over a sheet of paper so that the paper's surface becomes electrically charged.
8. The area of the drum freshly coated with toner spins into contact with a positively charged sheet of paper. The electric field surrounding the paper exerts a stronger pull than the ions coating the drum's surface, and the toner particles stick to the paper as the drum passes by.
9. Once the entire original has been recreated on toner in the page, the paper proceeds on through the copier to the fuser. The weak attraction between the toner particles and the surface of the sheet of paper can easily be disrupted. To fix the toner image in place on the paper's surface, the entire sheet is shunted through the fuser's heated rollers. The heat melts the plastic material in the toner and fuses the pigment to the page

Fax machine

How real fax machines work:-

Fig.1 A Fax Machine

Well, okay, it's not *exactly* how they work! A fax machine is designed to both send and receive documents so it has a sending part and a receiving part. The sending part is a bit like a computer scanner, with a CCD (charged-coupled device) that scans only one line of a document at a time, and only in black and white.

Crudely simplified, it looks at each line separately, detects the black areas and the white areas, and transmits one kind of electric pulse down the phone line to represent black and another to represent white (just like saying "black" and "white", in fact). The phone line transmits this information almost instantly to a fax machine at the other end. It receives the electrical pulses and uses them to control a printer.

If the receiving fax hears "black", it draws a tiny black dot on the page; if it hears white, it moves along slightly, leaving a white space instead. It takes about a minute or so to transmit a single page of writing (or a complex drawing) in this clumsy but very systematic way.

1. To send a fax, you feed the page into the input slot and it's pulled in between several pairs of rollers. Larger fax machines have built-in document feeders that automatically feed in multiple pages from a stack, so you don't have to stand at the machine feeding in pages one at a time.

2. As the paper moves down, a bright light shines onto it. White areas of the page reflect a lot of light; black areas reflect little or none.
3. The light reflects off the page into a light-detecting CCD (charged-coupled device).
4. The CCD turns the analog pattern of black and white areas on the page into a numeric (digital) pattern of binary zeros and ones and passes the information to an electronic circuit.
5. The circuit sends the digital information down the telephone line to the fax machine at the receiving end.
6. When you receive a fax, the same circuit takes incoming digital information from the phone line and routes it to a built-in printer.
7. In a typical personal fax machine, paper is pulled from a large roll inside the machine. (In a larger office fax machine, it usually comes from a plain-paper hopper, similar to the one in a laser printer.)
8. The thermal (heat-based) printer, operated by the circuit, reproduces the incoming fax on the paper as it moves past.
9. An automatic blade cuts the page and the printed fax emerges from the output slot.

You can see that there are really two separate machines in one: a fax-sender and a fax-receiver. When you use a fax machine to make quick "photocopies" of documents, the two machines link up together: instead of sending a fax down the phone line, the circuit reroutes the scanned data directly to the printer so you get a copy of your original document.

Fax machines come in three basic kinds called group 1, group 2, and group 3. The group number is, broadly speaking, a measure of how fast the machine can send and receive: a group 1 machine sends and receives at the slowest speed (about six minutes per page), group 2 can manage a page in about three minutes, and group 3 zips along at a minute or less per page.

When a fax machine first dials another fax machine, there's a short (typically 15–30 second) period of handshaking where the machines agree on the speed they will use for

the transmission. It's always the slower machine that governs the speed so, even if you have a fast group 3 machine, it will still work at the slowest possible speed if you're sending faxes to (or receiving faxes from) a group 1 machine at the other end of the line.

Pros and cons of fax machines

The great thing about faxing is that it's very simple: just put your document in the machine, dial the number, wait for the other machine to reply, and hit the START button. Receiving a fax is even easier: assuming your machine is set to AUTO, you don't need to do a thing. But there are some drawbacks too.

Most fax machines use low-cost thermal printers that burn images into heat-sensitive paper (fax machines like this typically use tight rolls of paper rather than sheets). The paper is quite expensive to use, fades very quickly, and can't be recycled in the usual way. It also takes a long time to send a fax: if it takes a minute per page, a 30-page document will take over half an hour to transmit.

Another drawback is the crudeness of faxed documents. A fax machine senses areas of black and white by shining a bright light onto the page it's transmitting and using photocells (light-sensitive electronic components) to measure the light reflected back again.

The photocells transmit when they see white areas and don't transmit when they see black. In other words, they can't distinguish shades of gray (or what printers call "half-tones"). That means a photograph or artwork sent by fax will lose much of its detail and may even become completely unrecognizable at the other end.

For all these reasons, many people now prefer to send documents as email attachments. They're quicker and more convenient, you can print them out (or not, as you wish) on decent paper, and you can send and receive things in full-color and shades of gray.

Perhaps most importantly, the files you receive by email are generally digital documents that you can edit in other ways, whereas a fax is essentially an analog thing—and all you can do is read it or file it (if you're very lucky, you might be able to scan it and turn it

into an editable document). Some telephone companies also offer fax-to-email services where you're allocated a unique telephone number.

If someone faxes you on that number, the company receives the fax for you at a central computer complex, converts it into an image file (such as JPG or TIFF) or PDF, and then forwards it on to you by email. In much the same way, most computers that have a dialup (fax) modem can also send faxes to people very easily without extra equipment. So, dated though it may be, fax technology is probably here to stay for a few more years yet!

Printer

When we discuss the principles of operation for any device (not just printers), we are referring to the way that they work. In the case of printers, it is useful to be aware of the quality and cost of the final output to allow us to make a choice of which to use for a particular purpose.

Laser printers make use of a powder containing magnetic material called toner. The printed output is created by fusing this toner to the paper using the following steps:-

Operation sheet: 1 Operation Principles of Printer

1. Paper is taken from the tray using a roller
2. The drum (shown in yellow) is given a negative charge all over
3. The laser uses a mirror to direct a beam onto the roller inverting the charge in the areas to be printed (*forming a negative of the document*)
4. The drum is coated with toner which has a positive charge. The toner is then repelled where the negative charge remains
5. The paper is moved using rollers & the drum rolls over the paper, transferring toner onto it
6. The paper is then fed through the *fuser* (two heated rollers) melting the toner onto the paper.

(Some printers use a positively charged drum and negatively charged toner. The important thing to remember is that the charges are always opposite.)

And if you've ever wondered why the paper from a laser printer is hot, it's not the laser – it's the fuser!

Fig.1 Printer Machine

Scanner

Working Principles of Scanner

In recent years, scanners have become an important part of families and offices. Scanner technology is ubiquitous and used in a variety of ways. A flat-plate scanner, also known as a desktop scanner, is the most functional and commonly used scanner. Let's learn how the scanner works together.

1. **Working principle of scanner - introduction**

As the third generation of computer input equipment after keyboard and mouse, the scanner is a high-precision photoelectric integrated high-tech product, using photoelectric technology and digital processing technology to input various forms of image information into the computer. It can scan, analyze and convert images such as photos, printed documents, or handwritten documents, or small objects such as ornaments into digital images by capturing images and converting them into the form that can be displayed, edited, stored, and output on computers. People usually use

scanners to input computer images which are the most informative form, and at work, maybe you need a pdf camera scanner.

2. Working principle of scanner - structure

The components of a typical flatbed scanner include CCD array, reflector, scanning head, glass plate, lamp, lens, upper cover, color filter, stepping motor, balance rod, transmission belt, power supply, interface port, and a control circuit.

The CCD array is the core component of the scanner. CCD is the most commonly used technology in the field of scanner image capture. CCD is composed of a large number of tiny photosensitive diodes(light spots), which can convert photons (light) into electrons (charge). In short, each light spot is sensitive to light - the brighter the light incident on a single light spot is, the more charge accumulated in this light spot is. The scanned document image passes through a series of mirrors, color filters, and lenses to reach the CCD array. The specific arrangement of these components depends on the scanner model, but the basic principle is roughly the same.

The working principle of the scanner is not complicated, which can be basically reflected in its working process. Just like high speed camera scanner, it scans the original document optically, then transmits the optical image to a photoelectric converter to be converted into an analog electrical signal, and then converts the analog electrical signal into a digital electrical signal, and finally sends it to the computer through the computer interface.

Fig.1 Scanner Machine

The steps of scanning images by the scanner are as follows: firstly, the front face of the manuscript to be scanned is laid down on the glass plate of the scanner, and the manuscript can be a text or a drawing photo; after the scanner driver is started, the movable light source installed inside the scanner starts scanning the original. In order to uniformly illuminate the manuscript, the scanner light source is oblong and sweeps the whole manuscript along the Y direction.

The light irradiated on the manuscript passes through a very narrow gap after being reflected to form a light band along the X direction, passes through a group of reflectors, and focused by an optical lens and enters a spectroscope, and three RGB color light bands obtained through a prism and a red, green and blue color filter respectively shine on respective CCD, the CCD converts the RGB light band into an analog electronic signal, and the signal is converted into a digital electronic signal by an A/D converter.

Now, the optical signal reflecting the original image is converted into a binary digital electronic signal acceptable to the computer and finally sent to the computer through serial or parallel interfaces. The scanner obtains one line of image information of the

original document in the X direction every time it scans one line. As it moves along the Y direction, the original document is gradually formed inside the computer.

UPS

An uninterrupted power supply system is an electrical device that provides power at times of emergency when the electricity from the primary source fails. UPS dealers supply UPSs to different shops all over. UPS manufacturers, on the other hand, with the manufacture of best quality UPS is serving the entire nation.

The UPS is used to protect hardware systems such as telecommunication devices or computers. A UPS is used for those electrical types of equipment where there is a chance of an interruption in the main power supply that can harm the hardware or can result in the loss of data.

Main components of the UPS system

The heart of the UPS system is the battery. If there is a failure in the primary source of current supply, your equipment can entirely depend on the array of cells of the UPS to maintain the load.

At least one string of battery is required in the UPS system, but this can vary depending on the voltage of direct current in the system. The cells attached to every string are connected to each other in a series and thus when one battery fails, then the entire chain of batteries fail.

A static switch is a circuit internally inserted in a UPS system that defends the failure of the UPS system. In a situation when your system fails to avoid interruption, then the static switch shuts the circuit automatically and then helps in successfully diverting the power around the batteries and the rectifier. The inverted then utilizes the power and delivers it to the load.

Although the power is unconditioned, this allows the UPS system to function correctly even when there is an internal component failure.

Another component of the uninterrupted power supply system is the rectifier. The rectifier usually performs two primary functions. The first job of the rectifier is that it keeps the batteries in the gadget charged so that a sufficient amount of voltage is available to the batteries. This part of the system also coverts the incoming current from alternating current to direct current. Hence it is beneficial in exchanging the alternating current devices into direct current devices.

The last and the essential part of the UPS system is the inverter. The inverter accepts direct current from its primary source which is delivered by the battery and the rectifier. If there is a power shortage, the rectifier stops supplying current to the direct current source.

In that situation, the inverter is the only medium through which the direct source receives current until the batteries get exhausted and are unable to sustain the load anymore.

Fig.1 UPS

Application of a UPS system

You never know when there will be a power cut as it is likely to say that problems related to power supply occur almost every day. Lighting effects the power lines and the sudden interruption in the power supply can create substantial harm to your

hardware systems. Thus having a UPS connected to your computer can save it from such damages. UPS can support load very well. The device can control about 60% of the output load and thus is very reliable.

The benefits of a UPS system

A UPS provides benefits to both offices for homes and business purposes. The most critical role of a UPS is that maintains the supply of power in the situation when there is a load shedding or power blackout. It continues to operate throughout the case by supplying the current on its batteries under normal circumstances.

But as soon as the device recognizes that there is an interruption in the power supply from the external source it automatically switches from the wall power to the alternating current which is offered by its batteries.

Demerits of a UPS system

The installation cost of the UPS system is very high. Even if you want to purchase a UPS for your home, it can cost you hundreds of dollars and if for office use you will have spent at least thousands of dollars. It is true that if you want to install a UPS at your home, you will not need many setups but a large corporate sector will need to have many additional units. On the other hand, the batteries in the UPS are not durable. It depends on their quality that how long will they work.

Self-Check 6	Written Test

Directions: Answer all the questions listed below.

1. Write the benefits of UPS (2 points)
2. Write down the working principles of scanner(3 points)
3. How a printer operates?(3 points)
4. What is polishing?(2 points)
5. What are microwaves?(2 points)

Note: Satisfactory rating 7 and 12 points Unsatisfactory below 7 and 12 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Information Sheet 7. checking to ensure that no unnecessary damage has occurred and complies with requirements.

1.7. checking to ensure that no unnecessary damage has occurred and complies with requirements.

Safety tips for cleaning up damp or wet locations Electricity and water do not mix.
To help reduce the risks associated with using electrical appliances in wet locations, use a ground fault circuit interrupter (GFCI) to help prevent shocks. These devices are inexpensive and can help protect you when operating appliances such as dry/wet vacuum or other equipment. Reconditioning flood or water damaged equipment.

Do not plug in or attempt to use electrical appliances that have been wet until they have been serviced by an electrician or service agency. Certain electrical equipment that has been submerged may have to be replaced, while other equipment could be serviced by qualified personnel.

Ask your electrician or contact the manufacturer or dealer for the nearest service location.
All breakers, fuses, disconnect switches, GFCI's, AFCI's, and surge protective devices that have been submerged must be replaced. There is no method of insuring these life safety devices will operate as intended when they are exposed to water;
Electrical wiring may require replacement depending on the type of wire or cable and the extent of the damage;

To take proper corrective action, working knowledge of electrical systems and of the affected equipment and wiring is required to properly assess damage due to contact with water and pollutants. In many cases replacement of the affected wiring and equipment is the only safe alternative, even if no visible damage is apparent. Simply allowing equipment and wiring to "dry out" and then reenergize it is not a recommended practice. Attempts to recondition equipment by unqualified persons may result in additional hazards due to the use of improper cleaning agents and techniques.

A licensed electrical contractor, knowledgeable in this type of work, should be engaged to evaluate and repair or replace water damaged electrical equipment and wiring.

Electrical equipment or components that have been replaced due to water damage should be destroyed and must not be re-used in another application.

Lightning storms pose an even greater danger to computers. The safest way to avoid damage to your electronic devices is to unplug them during a lightning storm. Unplugging during a power outage is not as crucial, especially if you have a surge protector.

An uninterruptible power supply can save data during an outage, and a surge protector can prevent damage from a surge. Surge protectors absorb or ground overvoltage from spikes. Each time a surge protector does its job, resulting damage can reduce effectiveness for the next surge.

A sudden loss of power, such as during a power outage, may result in electronics data loss, and repeated instances may cause bad sectors in a hard drive. However, the real danger comes the moment electricity is restored. Overvoltage sometimes surges through power lines, posing a risk to the electronic devices.

Self-Check 7	Written Test

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

I. Write True if the statement is True and False if the statement False (each 2 point)

1. A sudden loss of power, such as during a power outage, does not result damage to electronic components.
2. Surge protectors absorb or ground overvoltage from spikes
3. Electrical equipment or components that have been damaged should be re-used
4. If any damage happened to electrical equipment, we should replace it.

. Answer the following question!

Note: Satisfactory rating 8 and 15 points Unsatisfactory below 8 and 15 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Information Sheet 8 Checking Circuits as being isolated according to OHS procedures and requirements

1.8. Checking Circuits as being isolated according to OHS requirements and procedures.

Prior to beginning work on any live installation, the Electricity at Work requires that three conditions must be met. These include:

1. Circumstances make it unreasonable to conduct work on dead circuit;
2. It is reasonable given circumstances to work in or near live circuit; and
3. Suitable precautions are taken prior to work—where possible, dead work is always preferable to live work.

Isolate the voltage

When these three conditions are met, live work may proceed, but minimum safe isolation procedures should be followed. These include:

1. Identify correct isolation point or device.

   For all work on low voltage electrical equipment or circuits, it is important to ensure that the correct point of isolation is identified. When isolating the main

source of energy, it is also essential to isolate any secondary source (such as standby generators, uninterruptable power supplies and micro generators).

2. Check condition of voltage indicating device —such as a test lamp or two-pole voltage detector.
3. Switch off installation/circuit to be isolated.

   It should never be assumed that equipment is dead because a particular isolation device has been placed in the OFF position.

4. Verify with voltage indicating device that no voltage is present.

   It is important to ensure that the correct point of isolation is identified before proving dead. Adequate precautions should be taken to prevent electrical equipment which has been made dead, is carried out on or near that equipment, from becoming electrically charged during that work.

5. Re-confirm that voltage indicating device functions correctly on proving unit. Use proving unit to confirm that the voltage on the indicating device is functioning correctly.
6. Lock-off device used to isolate installation circuit.

   It is preferable for an appropriate locking-off device be used on the point of isolation.

7. Post warning notices.

   Suitable labeling of the disconnected conductors using a caution notice is vital to prevent the supply being reinstated.

   Verification can also be accomplished using monitoring instruments such as a voltmeter to test electrical circuits to determine that there is no electrical energy available to the machine or equipment. Similar test equipment could be used to check for the presence of other energy types and sources.

Self-Check 8	Written Test

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

1. What are the conditions that should be met to proceed work with electricity?(4 points)
2. What are the minimum safe isolation procedures that should be followed?(5 points)
3. What does isolating voltage mean?(3 points)

. Answer the following question!

Note: Satisfactory rating 7 and 12 points Unsatisfactory below 7 and 12 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

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L #9	LO #2- Commission Home/Office Electrical/Electronic equipments

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Carrying out OHS risk control measures and procedures
- Testing/measuring devices by connecting and setting up in accordance with requirements
- Making measurements and adjustments to provide optimum system performance/regulatory requirements.
- Making decisions for unexpected situations with appropriate person for specifications and requirements.
- Selecting methods for unexpected situations on the basis of safety and specified work outcomes.
- Performing systems' commissioning procedures with requirements.
- Carrying out commissioning efficiently without unnecessary waste of materials or damage to apparatus and to the surrounding environment .

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Carry out OHS risk control measures and procedures.
- Test/measure devices by connecting and setting up in accordance with requirements.
- Make measurements and adjustments to provide optimum system performance/regulatory requirements.
- Make decisions for unexpected situations with appropriate person for specifications and requirements.
- Select methods for unexpected situations on the basis of safety and specified work outcomes.

- Perform system' commissioning procedures with requirements.
- Carry out commissioning efficiently without unnecessary waste of materials or damage to apparatus and to the surrounding environment.

Learning Instructions:

Information Sheet 1 Carrying out OHS risk control measures and procedures

2.1 .**Carrying out OHS risk control measures and procedures**

To carry out OHS risk control measures and procedures, the employer has a duty to care for the health and safety of employees. To do this he must ensure that:

- The plant, tools and equipment are properly maintained.
- The necessary safety equipment – such as personal protective equipment, dust and fume extractors and machine guards – is available and properly used;
- The workers are trained to use equipment and plant safely.
- Take reasonable care to avoid injury to themselves or others as a result of their work activity.

Use the right tools for right works. Never use any power tools without permission from responsible person.

Dress correctly:

- Always you have to wear the correct dress for a specific task.
- Don't fool around "Horse play".
- You may cause injuries to your self, to the other participants and damage equipment and machineries.

Take also care of small injuries:

Small cuts, burns, scratches are common in the work shop and building site. They may be caused by burrs left from cutting, filing, tightening on vices or grinding with the file immediately after the cutting or filing because of very sharp edges. Protect your hands with proper gloves or rags when handling pipes or sheet metals.

Use wire brush to remove metal chips or burrs; don't use your bare hands.

Chemicals, explosive materials and other burnable material have to be covert and to be stored in a suitable container/area.

Warning for explosive staff

When working with power hand tools or machineries, you protect the cable from sharp edges or falling down items.

In case of doubt, report to your instructor. Only a professional electrician must deal with repairs – not you!

Warning for Electric power

Avoid standing in your own light. You need the best light possible to do accurate work and avoid injury.

When working with rotating tools, closely fitting clothes are to be worn.

Don't grip into pressing or notching adaptors when making the joints.

Tools and materials are to be deposited clearly and neatly arranged.

Under all conditions, stop, look, and think before you proceed in dangerous or unknown and unfamiliar situations.

Working Area

Keep your working area, especially the floor, clean and free from any unnecessary items that can cause slipping or stumbling. Materials should be properly stored in a material rack. Protect the floor against spilled cutting oil. During cutting action use always a collecting basin to catch the remaining/waste.

Tools

Use only tools, which are in proper condition: unspoiled, complete and sharp.
Never use damaged tools like files without handle, or hammer without wedges. Wipe the handles of tools clean if they are oily or greasy. Slippery tools can glide out of your hand and can cause accidents.

Care of warmed up materials

Always wear leather gloves to handle hot work pieces. Use soapstone to write "hot" on it. This will warn your colleagues before handling the work pieces.

Workplaces can be dangerous; there are many hazards that have the potential to kill, injure or cause ill health or disease. Protecting the health and safety of people in the workplace is a community expectation that makes good business sense.

Workplace incidents can have a dramatic impact on people's lives (people in the workplace, families and friends), and they can have significant financial impacts on organizations through loss of skilled staff and lost production of goods or services.

A safe and healthy workplace and compliance with the law does not happen by chance or guesswork. Good health and safety is all about eliminating and controlling hazards and risks. This is best achieved by a proper consideration of the sources of harm and what can be done to prevent the harm from occurring.

This guide sets out the method that should be used to control OHS hazards and risks. The OHS Act duties anticipate, and WorkSafe expects, that the method set out in this guide will be used for the control of OHS hazards and risks.

Step 1 – **Identify hazards**

Identifying hazards involves finding all of the foreseeable hazards in the workplace and understanding the possible harm that the hazards may cause.

A piece of plant, substance or a work process may have many different hazards, and each of these hazards needs to be identifi ed. For instance, a production line may have mechanical hazards, noise hazards, electrical hazards, body stressing hazards associated with manual handling and psychological hazards associated with the pace of work.

Methods for identifying hazards There are a number of methods for identifying hazards. The following are the most common:

Inspecting the workplace

A walk through the workplace is a direct way of identifying many hazards. This walk-through can be assisted by using a hazard checklist developed in consultation with employees to suit the workplace. Inspections should not be limited to physical things

such as plant, equipment or buildings and structures. The inspection should also look at systems of work and work procedures.

The walk-through may detect straightforward problems and action should be taken on these immediately:

- Some may be simple matters such as a risk control not being used or not working properly, or things being put in the wrong place. There is no need to do a formal risk assessment – action can be taken without delay to eliminate or control the risk – and consultation can take place on the spot with the employees or HSRs doing the inspections, and with the people doing the work.
- At the other end of the scale, a walk-through may detect a situation that represents an immediate or substantial danger to people doing work. The work causing the risk should either be stopped immediately or the people moved to safety.

Finding and applying available information

A large amount of information is readily available for particular industries, types of activity and job types. Sources of information include:

- WorkSafe publishes information on its website and in hard copy on a range of OHS topics and industries. Visit www.worksafe.vic.gov.au or read the WorkSafe publication More information about Controlling OHS hazards and risks.
- Industry associations and unions can provide information about hazards in particular industries or particular jobs.
- Manufacturers and suppliers can provide information about hazards associated with specific plant, substances or processes.
- Material Safety Data Sheets (MSDS) from manufacturers or suppliers of workplace substances.

- Work Safe's workers' compensation insurance agents.
- Technical and OHS specialists.

Some hazards such as noise and atmospheric contaminants may require measurement to decide if further action is required. For instance, there are simple comparisons that can be made to estimate general noise levels (e.g. can people working within close proximity be easily heard?), and testing and measuring can provide a more accurate determination of the hazard (e.g. noise meters, atmospheric testing).

Surveys of employees and others at the workplace

Conducting a survey of employees and others who work at the workplace can provide valuable information about matters such as workplace bullying, occupational stress, as well as muscle and skeletal aches and pains that can signal potential hazards.

Analyzing records and data

Records of injuries or incidents and the results of any investigations are useful sources of information about hazards. Larger organizations may even have records or data that show incident and injury trends. WorkSafe and other workplace safety authorities publish data about the common sources of injury in particular industries. Similarly, some industry associations may have data about the hazards that have caused injuries in the industries that they cover.

Hazard identification outcomes

Hazard identification provides a complete knowledge of the hazards for the particular part of the workplace assessed. Keep a list of what the hazards were and where they were identified to ensure that nothing is forgotten.

Step 2 – Assess risks

Risk assessment is a process for developing knowledge and understanding about hazards and risks so that sound decisions can be taken about control. A formal risk assessment is unnecessary if the knowledge and understanding already exist. However, there will be many times when a risk assessment is the best way of building knowledge and understanding.

Risk assessment assists in determining:

• what levels of harm can occur

• how harm can occur

• the likelihood that harm will occur.

A risk assessment will provide knowledge to make informed decisions about controlling hazards and risks. The risk assessment needs to be tailored to the situation and to the organization in which it is conducted; it can be as simple as structured discussion during consultation or it can be more elaborate and formal.

A risk assessment should be done when:

- There is only limited knowledge about a hazard or risk, or about how the risk may result in injury or illness.
- There is uncertainty about whether all of the things that can go wrong have been found.
- The situation involves a number of different hazards that are part of the same work process or piece of plant, and there is a lack of understanding about how the hazards may impact upon each other to produce new or greater risks.

There are common events in the life of an organization when a risk assessment should be done. These events typically result in a lack of understanding about OHS hazards and risks or what needs to be done to control them.

When a risk assessment is not necessary

Many hazards and risks are well known and have well established and accepted control measures. A formal risk assessment is not required

When:-

- OHS laws require some hazards or risks to be controlled in a specific way. These requirements must be complied with.
- Other laws require specific risk controls to be implemented, e.g. gas and electrical safety and dangerous goods laws. These requirements must be complied with.
- How many people could be harmed? If something goes wrong, is one person affected or are many people affected? For example, a mobile crane collapse on a busy construction site has the potential to kill or injure a large number of people
- Are there circumstances that could magnify the severity of an injury or incident? Using information about the nature of risks and the effectiveness of controls can provide an indication of the potential harm when more than one thing goes wrong.
- When assessing how things may go wrong, look more broadly than the immediate effects. Can one failure initiate other failures? Is there something in the workplace that can be affected to cause the incident to become more serious?

For example, failure of electrical supply can cause risk controls that rely on electricity in the workplace to become ineffective unless they are ‘fail safe’. The presence of large amounts of unnecessary combustible materials in a workplace can spell disaster in the event of an initial minor fi re that is not controlled quickly.

Step 3 – Control hazards and risks

Duty-holders are required to ensure health and safety by controlling risks. Risks must be controlled by eliminating them so far as reasonably practicable or, if this is not possible, reducing the risks that remain so far as reasonably practicable.

Arriving at appropriate controls involves:

• Identifying the options for controls. A control option may be a single control or it may be made up of a number of different controls that together provide protection against a risk.

• Considering the control options and selecting a suitable option that most effectively eliminates or reduces risk in the circumstances.

• Implementing the selected option. Note: mandatory controls specifi ed in the OHS regulations must be implemented regardless of the results of the method in this guide.

Reasonably practicable Duty-holders are required to ensure health and safety so far as reasonably practicable. Determining what is reasonably practicable to protect people from harm involves weighing up all the following matters and making a judgment about what is reasonable in the circumstances:

• The likelihood of a hazard or risk occurring

. • The degree of harm that would result if the hazard or risk occurred

. • What the duty-holder knows, or reasonably ought to know, about the hazard or risk, and any ways of eliminating or reducing the risk.

• The availability and suitability of ways to eliminate or reduce the hazard or risk

. • The cost of eliminating or reducing the hazard or risk**.**

Some controls are more effective than others The various ways of controlling risks can be ranked from the highest level of protection and reliability to the lowest.

According to this ranking:

- The most effective protection measure is to eliminate the risk, which can be done by eliminating the hazard. If the hazard cannot be eliminated, then eliminate as many of the risks associated with the hazard as possible.
- The second most effective measure is to reduce the risks that remain by changing the risk to reduce the likelihood and/or level of harm. These measures are more effective than those that rely on controlling the behavior of people.
- The least effective measure is to change the way people expose themselves to the risk or their behavior. This does nothing to change the risk itself, but relies on protecting people by controlling the behavior or skill levels of people, limiting the chance of human failure, limiting exposure time or by providing personal protective equipment for people to use.

Eliminating the hazard or risk Eliminating hazards A hazard can be eliminated if it is not really necessary to have the hazard in the workplace to start with.

A hazard may not be able to be eliminated if doing so means that the end product or service cannot be made or delivered.

Example: A commercial kitchen that prepares fried food requires a deep fryer. If the fryer was not available, this type of food could not be prepared. This hazard is necessary for the operation of the kitchen.

Reducing risks

If it is not possible to eliminate the hazards or all of the risks, steps need to be taken to reduce the likelihood or degree of harm of the hazards and risks that remain.

Self-Check 1	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect (each 1 point)

1. Use any power tools without permission from responsible person.
2. Use wire brush to remove metal chips or burrs; don't use your bare hands.
3. When working with rotating tools, closely fitting clothes are to be worn.
4. Under all conditions, stop, look, and think before you proceed in dangerous or unfamiliar situations.
5. Keep your working area, especially the floor, unclean and unfree from any unnecessary items that can cause slipping or stumbling.

Part II Answer the following questions(each 3 points)

1. How to identify hazards?
2. Write down the steps of OHS risk control measures and procedures?
3. What is the difference between reducing hazard risk and eliminating hazard risk?

Note: Satisfactory rating 8 and 14 points Unsatisfactory below 8 and 14 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date_____

Information Sheet 2. Testing/measuring devices are connected and set up in accordance with requirements for a particular system.

2.2 Testing/measuring devices are connected and set up in accordance with requirements for a particular system.

Step 1 | Define the System's Required Measurement Performance

Now that we have a better understanding of sensitivity, what do we mean when describing the accuracy of an instrument? In fact, there are two types of accuracy to consider, namely absolute accuracy and relative accuracy.

Absolute accuracy indicates the closeness of agreement between the result of a measurement and its true value, as traceable to an accepted national or international standard value.

Devices are typically calibrated by comparing them to a known standard value.

Most countries have their own standards institute where national standards are kept. The drift of an instrument refers to its
ability to retain its calibration over time.

Relative accuracy refers to the extent to which a measurement accurately reflects the relationship between an unknown and a locally established reference value.

Step 2 | Designing the Measurement System

The next step gets into the actual process of designing the measurement system, including the selection of equipment and fixtures, etc. As mentioned

previously, interpreting a data sheet to determine which specifications are relevant to a system can be daunting, so let's look at some of the most important specs included:

Step 3 | Building and Verifying the Test System

This step addresses building the test system and verifying its performance, including a number of techniques that can be used to improve measurement quality.

Large systems with lots of cabling (and therefore, lots of cable capacitance, and/or those that measure high impedances ($\tau = RC$) may require even longer delays or special techniques like guarding.

Coaxial cable typically has capacitance in the range of 30pF per foot. The common solution is to provide sufficient delays in the measurement process to allow before settling.

Delays of several milliseconds are commonly needed, but some applications may require even longer delays.

To address this need, most Keithley instruments include a programmable trigger delay.

Guarding is one technique for dealing with capacitance issues, reducing leakage errors and decreasing response time. Guarding consists of a conductor driven by a low impedance source surrounding the lead of a high impedance signal. The guard voltage is kept at or near the potential of the signal voltage.

TESTING POTENTIOMETERS (variable resistors)

To check the value of a variable resistor, it should be removed from circuit or at least 2 legs should be removed. A rheostat is a variable resistor using only one end and the middle connected to a circuit.

The resistance between the two outside pins is the value marked on the component and the center leg will change from nearly zero to the full resistance as the shaft is rotated.

Fig. Potentiometer

Operation sheet-1 procedures of testing potentiometer

1. Find out the rating of the potentiometer

   This is actually the total resistance measured in ohms and it can usually be found written on the bottom or the side.

2. Get an ohmmeter (multi-meter) which you will set to a setting that is higher that your potentiometer's total resistance. For example, you can set the ohmmeter to 10,000 ohms if the rating of the potentiometer is 1000 ohms.

3. Take a closer look at the potentiometer. Locate the three tabs that should be sticking out of it. Two of those tabs are called “ends” while the third one is called

a “wiper”. Most of the time, the two ends are located next to each other, while the wiper is somewhere else.

4. Take the probes of your ohmmeter. Put them on the two ends of the potentiometer. What you see on the display should be within only a few ohms of the potentiometer's rated resistance (see Note below). If the reading is way off, then that means that you have put one of the probes of the ohmmeter on the wiper. If you find it difficult to tell which tabs are the ends, and which tab is the wiper, try different combinations with the probes until you get a proper reading.

5. Turn the controller all the way to the other side. Make sure to keep the probes in constant contact with the ends while doing this. The resistance should stay the same or only change very slightly.

   The actual reading may not be exactly what the potentiometer is rated for. These devices typically have a tolerance of 5-10%. Tolerance may be listed on the device but not always. The reading you get should not be outside of that range (e.g. a 10,000 ohm device rated 5% should read between 9500-10500 ohms).

6. Take one of the ohmmeter's probes off the end and put it on the wiper. Now you have to turn the controller slowly all the way to the other end and watch the ohmmeter while doing so. When you reach the end, the resistance should only be a few ohms. At the other end the value should be the maximum resistance of the potentiometer. The resistance should gradually and slowly increase as you turn the controller and there should be no sudden jumps.

TESTING A CAPACITOR

Operation sheet-2 procedures to test a capacitor

1. Disconnect the suspected capacitor from the power supply or make sure at least. one lead of the capacitor is disconnected.
2. Make sure that the capacitor is fully discharged.
3. Connect two separate leads to the capacitor terminals. (Optional).

4. Now safely connect these leads to 230 V AC Supply for a very short period about (1-4 Sec) [or for a short time where the Voltage rise to 63.2% of the Source Voltage] .
5. Remove safely leads from the 230 V AC Supply.
6. Now short the capacitor terminals (Please be careful to do that and make sure that you have wear safety goggles).
7. If it makes a strong spark, then the capacitor is good.
8. If it makes a weak spark, then it is a bad capacitor and change it immediately with a new one.

TESTING COILS, INDUCTORS and YOKES

You can test this component for continuity between the ends of the winding and also make sure there is no continuity between the winding and the core.

It is important to understand the turns are insulated but a slight fracture in the insulation can cause two turns to touch each other and this is called a "shorted turns" or you can say the inductor has "shorted turns."

When this happens, the inductor allows the circuit to draw more current. This causes the fuse to "blow."

The quickest way to check an inductor is to replace it, but if you want to measure the inductance, you can use an inductance meter. You can then compare the inductance with a known good component.

An inductor with a shorted turn will have a very low or zero inductance, however you may not be able to detect the fault when it is not working in a circuit as the fault may be created by a high voltage generated between two of the turns.

Faulty yokes (both horizontal and vertical windings) can cause the picture to reduce in size and/or bend or produce a single horizontal line.

A TV or monitor screen is the best piece of Test Equipment as it has identified the fault. It is pointless trying to test the windings further as you will not be able to test them under full operating conditions.

MEASURING AND TESTING INDUCTORS

Inductors are measured with an inductance meter but the value of some inductors is very small and some Inductance meters do not give an accurate reading.

The solution is to measure a larger inductor and note the reading. Now put the two inductors in series and the values add-up - just like resistors in series. This way you can measure very small inductors.

TESTING ACTIVE COMPONENTS

TESTING DIODES

Diodes can have 4 different faults.

1. Open circuit in both directions.

2. Low resistance in both directions.

3. Leaky.

4. Breakdown under load.

TESTING A DIODE ON AN ANALOGUE METER

Testing a diode with an analogue multimeter can be done on any of the resistance ranges. [The high resistance range is best - it sometimes has a high voltage battery for this range but this does not affect our testing]

There are two things you must remember.

1**.** When the diode is measured in one direction, the needle will not move at all. The technical term for this is the diode is reverse biased. It will not allow any current to flow. Thus the needle will not move.

2. When the diode is connected around the other way, the needle will swing to the right (move up scale) to about 80% of the scale. This position represents the voltage drop across the junction of the diode and is NOT a resistance value. If you change the resistance range, the needle will move to a slightly different position due to the resistances inside the meter. The technical term for this is the diode is forward biased. This indicates the diode is not faulty.

Testing BJT Using Analog Meter

Step 1 - FINDING THE BASE and Determining NPN or PNP

Get an unknown transistor and test it with a multimeter set to "x10"

Try the 6 combinations and when you have the black probe on a pin and the red probe touches the other pins and the meter swings nearly full scale, you have an NPN transistor. The black probe is base

If the red probe touches a pin and the black probe produces a swing on the other two pins, you have a PNP transistor. The red probe is base.

If the needle swings full scale or if it swings for more than 2 readings, the transistor is faulty**.**

Testing of Relays

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. Relays allow one circuit to switch a second circuit which can be completely separate from the first.

Relays are usually Single Pole Double throw (SPDT) or Double Pole Double Throw (DPDT) but they can have many more sets of switch contacts, for example relays with 4

sets of changeover contacts are readily available. The relay's switch connections are usually labeled COM, NC and NO:

Operation Sheet-3 testing a relay

1. Consult the relay schematic or data sheet
2. Do a basic visual inspection of the relay**.** Many relays have a clear plastic shell containing the coil and contacts. Visible damage (melting, blackening, etc) will help narrow down the issue.

   Most modern relays have an LED to tell you if they are in the active state (ON). If that light is off and you've got control voltage to the relay or coil terminals (typically A1[line] and A2 [common]) then you can safely assume that relay is bad.

3. Disconnect the power source**.** Any electrical work should be done with all power sources disconnected, including batteries and line voltage.[3] Be especially mindful of capacitors in the circuit, as they can hold a charge for a considerable length of time after removing the power source. Do not short capacitor terminals to discharge.

- It is best to check your local laws before performing any electrical work, and if you feel unsafe, leave it to the professionals. Extra low voltage work typically will not fall under this requirement, but it's still important to be safe.

4. Test the de-energized condition of the relay contacts. Use a digital multimeter (DMM) to test the resistance between each pole of the relay and the corresponding NC and NO contacts for that pole. All NC contacts should read 0 ohms to the corresponding pole. All NO contacts should read infinite resistance to the corresponding pole.
5. Energize the relay**.** Use an independent voltage source appropriate for the rating of the relay coil. If the relay coil is diode protected, make sure that the independent voltage source is connected with the proper polarity. Listen for a click when the relay is energized.

6. Check the energized condition of the relay contacts. Use a digital multimeter (DMM) to test the resistance between each pole of the relay and the corresponding NC and NO contacts for that pole. All NC contacts should read infinite resistance to the corresponding pole. All NO contacts should read 0 ohms to the corresponding pole.

Types of correct use test/measuring instrument

Capacitance meter

A capacitance meter is a piece of electronic test equipment used to measure capacitance, mainly of discrete capacitors. Depending on the sophistication of the meter, it may display the capacitance only, or it may also measure a number of other parameters such as leakage, equivalent series resistance (ESR), and inductance. For most purposes and in most cases the capacitor must be disconnected from circuit; ESR can usually be measured in circuit.

Ammeter

An ammeter (from Ampere Meter) is a measuring instrument used to measure the current in a circuit. Electric currents are measured in amperes (A), hence the name. Instruments used to measure smaller currents, in the milliampere or microampere range, are designated as *milliammeters* or *microammeters*. Early ammeters were laboratory instruments which relied on the Earth's magnetic field for operation. By the late 19th century, improved instruments were designed which could be mounted in any position and allowed accurate measurements in electric power systems. It is generally represented by letter 'A' in a circle.

Transistor tester

Transistor testers are instruments for testing the electrical behavior of transistors and solid-state diodes.

Types of tester

There are three types of transistor testers each performing a unique operation.

Quick-check in-circuit checker

Service type tester

Laboratory-standard tester

Self-Check .2	Written Test

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

Part I Fill the black space(each 3points)

1. _____ is a variable resistor that is to be used by varying its fixed value.
2. _____ is a meter used to measure the inductance value.
3. _____ is a measuring instrument used to measure the current in a circuit.
4. _____ is a piece of electronic test equipment used to measure capacitance, mainly of discrete capacitors.

. Answer the following question!

Note: Satisfactory rating 7 and 12 points Unsatisfactory below 7 and 12 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Information Sheet 3. Making measurements and adjustments to provide optimum system performance/regulatory requirements.

2.3 Making measurements and adjustments to provide optimum system performance/regulatory requirements.

Ohmmeter

An ohmmeter is an electrical instrument that measures electrical resistance, the opposition to an electric current. Micro-ohmmeters (microhmmeter or micro ohmmeter) make low resistance measurements. Megohmmeters (also a trademarked device Megger) measure large values of resistance. The unit of measurement for resistance is ohms (Ω).

Fig.1 Analogue Ohmmeter

Clamp meters

Clamp meters clamp around a conductor carrying a current to measure without the need to connect the meter in series with the circuit, or make metallic contact at all. Those for AC measurement use the transformer principle; clamp-on meters to measure small current or direct current require more exotic sensors like for example hall effect based systems that measure the non changing magnetic field to determine the current.

Fig.1 Clamp Meter

Oscilloscope

The interior of a cathode-ray tube for use in an oscilloscope are

1. Deflection plates
2. Electron gun
3. Electron beam
4. Focusing coil
5. Phosphor-coated inner side of the screen.

Oscilloscopes display the change of an electrical signal over time, with voltage and time as the Y- and X-axes, respectively, on a calibrated scale. The waveform can then be analyzed for properties such as amplitude, frequency, rise time, time interval, distortion,

and others. Modern digital instruments may calculate and display these properties directly. Originally, calculation of these values required manually measuring the waveform against the scales built into the screen of the instrument.[3]

The oscilloscope can be adjusted so that repetitive signals can be observed as a continuous shape on the screen. A storage oscilloscope can capture a single event and display it continuously, so the user can observe events that would otherwise appear too briefly to see directly.

Oscilloscopes are used in the sciences, medicine, engineering, automotive and the telecommunications industry. General-purpose instruments are used for maintenance of electronic equipment and laboratory work. Special-purpose oscilloscopes may be used for such purposes as analyzing an automotive ignition system or to display the waveform of the heartbeat as an electrocardiogram.

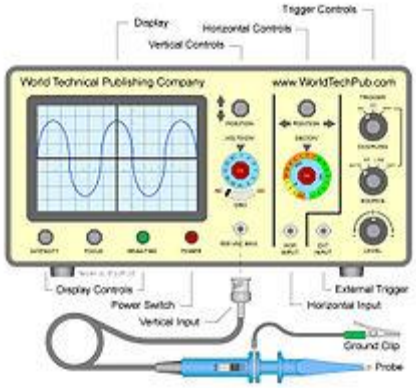

Fig.1 Oscilloscope

Wattmeter

The wattmeter is an instrument for measuring the electric power (or the supply rate of electrical energy) in watts of any given circuit. Electromagnetic wattmeters are used for measurement of utility frequency and audio frequency power; other types are required for radio frequency measurements.

Fig.1 Wattmeter

The wattmeter is an instrument for measuring the electric power (or the supply rate of electrical energy) in watts of any given circuit. Electromagnetic wattmeters are used for measurement of utility frequency and audio frequency power; other types are required for radio frequency measurements.

A typical wattmeter in educational labs has two voltage coils (pressure coils) and a current coil. The two pressure coils can be connected in series or parallel to change the ranges of the wattmeter. The pressure coil can also be tapped to change the meter's range. If the pressure coil has range of 300 volts, the half of it can be used so that the range becomes 150 volts.

Watt-hour meters

Watt-hour meter

An instrument which measures electrical energy in watt hours is essentially a wattmeter which accumulates or averages readings. Digital electronic instruments measure many parameters and can be used where a wattmeter is needed: volts, current,in amperes, apparent instantaneous power, actual power, power factor, energy in [k]W·h over a period of time, and cost of electricity consumed.

Voltmeter

Fig.1 Analogue Voltmeter

A voltmeter is an instrument used for measuring electrical potential difference between two points in an electric circuit. Analog voltmeters move a pointer across a scale in proportion to the voltage of the circuit; digital voltmeters give a numerical display of voltage by use of an analog to digital converter.

A voltmeter in a circuit diagram is represented by the letter *V* in a circle.

Voltmeters are made in a wide range of styles. Instruments permanently mounted in a panel are used to monitor generators or other fixed apparatus. Portable instruments, usually equipped to also measure current and resistance in the form of a multimeter, are standard test instruments used in electrical and electronics work. Any measurement that can be converted to a voltage can be displayed on a meter that is suitably calibrated; for example, pressure, temperature, flow or level in a chemical process plant.

General purpose analog voltmeters may have an accuracy of a few percent of full scale, and are used with voltages from a fraction of a volt to several thousand volts. Digital meters can be made with high accuracy, typically better than 1%. Specially calibrated test instruments have higher accuracies, with laboratory instruments capable of measuring to accuracies of a few parts per million. Meters using amplifiers can measure tiny voltages of microvolts or less.

Frequency counter

A frequency counter is an electronic instrument, or component of one, that is used for measuring frequency. Frequency counters usually measure the number of cycles of oscillation, or pulses per second in a periodic electronic signal. Such an instrument is sometimes referred to as a cymometer, particularly one of Chinese manufacture Systron-Donner frequency counter from 1973 with Nixie tube display.

Fig.1 Frequency Counter

Self-Check 3	Written Test

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

Part I Say True if the statement is Correct and False if the statement is incorrect

1. An ohmmeter is an electrical instrument that measures electrical resistance. (2 points)
2. Oscilloscopes display the change of an electrical signal over time, with voltage and time as the Y- and X-axes, respectively. (2 points)
3. The wattmeter is an instrument for measuring the electric current. (2 points)

. Answer the following question!

Note: Satisfactory rating 3 and 6 points Unsatisfactory below 3 and 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4. Making decisions for unexpected situations with appropriate person for specifications and requirements.

2.4 Making decisions for unexpected situations with appropriate person for specifications and requirements.

Unexpected events are unpredictable or beyond the control of human. The aim of this study was to identify the consequential problems of unexpected events faced by construction managers and project managers. In undertaking this investigation, we used an exploratory semi-structured interview and a questionnaire survey method. The results of this research showed that the consequential problems of unexpected events were frequently wicked, wicked messes and messes types of problems.

Furthermore, we found out that three most important factors for responding successfully to the consequential problems of unexpected events were:

1) organizations' structure and support,

2) Competent project manager and

3) Immediate actions. The findings of the study revealed that leadership, communication skills and hard-working were essential attributes of the competent project manager in responding to the consequential problems of unexpected events. Lastly, this research suggests the development of managerial reactive skills and control of behavioral responses through learning practice as key components of the required approach that need further investigations in future researches.

3 Simple Tips for Dealing with Unexpected Situations

1. **Detach:** A certain degree of emotional detachment is important. It helps you take a step back from problems, surprises and expected events, and therefore, to be less affected by them. This helps you stay calm and in control of yourself, and

therefore, be in a better position to deal with whatever is happening in your life without expectations**.**

Use a decision-making strategy, such as the tact strategies.

- Think a minute — let your mind settle.
- Assess the situation — gather information.
- Consider alternatives — generate options.
- Take a stand — follow-through with confidence

2.**Keep things in perspective**: For most of the things that happen to you, there's no way of knowing whether they will be a bad thing or a good thing — and which one an event turns out to be often has a lot to do with how you respond.

Here's 3 steps to help put things back into perspective :

A. **Stop the boat.** If momentum is driving you to make a decision quickly, then, do what we so rarely give ourselves an opportunity to do: think.

B. **Assess Your Actual Options.** Start with a blank slate: think about the outcome you want given the new situation, the information you have at hand, and the resources available. Then lay out your options.

C. **Sail.** Based on your new assessment, make a decision, and commit.

3.Meditate:. Practicing meditation every day can change your life and help you build resilience when faced with the unexpected.

Self-Check 4	Written Test

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

1. What are decision-making strategy to when we meet unexpected situations?(5 points)
2. What are 3 simple tips for dealing with unexpected Situations?(4 points)

. Answer the following question!

Note: Satisfactory rating 5 and 9 points Unsatisfactory below 5 and 9 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 5 Selecting methods for unexpected situations on the basis of safety and specified work outcomes.

2.5 .Selecting methods for unexpected situations on the basis of safety and specified work outcomes.

The ability to ensure process safety at a facility is influenced by many things: for example, employing appropriate technology in design and construction, anticipating the effects of external circumstances, understanding and dealing with human behavior, getting high reporting of near misses to learn from incidents, and having effective management systems. However, all of these efforts depend on a successful hazard evaluation program; without these evaluations, the company will not know what layers of protection are needed.

A successful hazard evaluation program requires tangible management support; sufficient, technically competent people (some of whom must be trained to use hazard evaluation techniques); adequate, up-to date information and drawings; and selection of the techniques (matched to the complexity and hazard of the process). Fortunately, a variety of flexible hazard evaluation techniques exist. Below is a simple listing of generally accepted techniques:

Qualitative Techniques:

These methods help a multi-disciplinary team

(1) identify potential accident scenarios and

(2) evaluate the scenario in sufficient detail to make a reasonable judgment of risk. If the team is confused on the risk, a scenario identified in a qualitative hazard review may be further analyzed using one or more of the quantitative techniques.

Checklist (traditional):

A detailed list of desired system attributes or steps for a system or operator to perform. Usually written from experience and used to assess the acceptability or status of the system or operation compared to established norms.

What-If Analysis:

A brainstorming approach in which a group of experienced people familiar with the subject process ask questions or voice concerns about possible undesired events. The method does not use guide words to help in the brainstorming.

What-If/Checklist Analysis:

A brainstorming approach in which a group of experienced people familiar with the subject process ask questions or voice concerns about possible undesired events. The method is similar to What-if alone, with the difference being that broad categories of types of concerns are used to structure the analysis.

2 Guide Word Analysis:

A systematic method in which potential operating problems are identified by asking what would happen is a step in a procedure were (1) skipped or (2) performed incorrectly. This method is applicable to any procedure (startup, shutdown, online maintenance, or normal batch operations), but does not apply to continuous operating mode.

Hazard and Operability (HAZOP) Analysis:

A systematic method in which potential operating problems are identified using a series of guide words to investigate process deviations. Can be applied to any mode of operation of a flow process and can also be applied to any procedure or flowchart.

Failure Modes and Effects Analysis (FMEA):

A systematic, tabular method for evaluating and documenting the effects of known types of component failures. Applies to electrical/mechanical systems. Can also be applied to flow systems where very high reliability factors are needed (such as fire-fighting water supply systems).

Quantitative Techniques:

These do not identify possible accident scenarios, but they instead aid in risk judgment by provide more detailed, statistical evaluations of the risk of a specific scenario.

Layer of Protection Analysis (LOPA):

A method that uses pre-defined values for initiating events, independent protection layers, and consequences to provide an order-of-magnitude estimate of risk. LOPA applies to a single cause-consequence pair. Scenarios are identified elsewhere (typically in a qualitative hazard evaluation).

Dow Fire and Explosion Index (F&EI):

A method, developed by Dow Chemical Company, for ranking the relative potential fire and explosion risk effect radius and property damage/business interruption impacts associated with a process. Analysts calculate various hazard and exposure indexes using material characteristics and process data.

Dow Chemical Exposure Index (CEI): Address five types of factors that can influence the effects of release of the material: (1) acute toxicity, (2) volatile portion of material which could be released, (3) distance to areas of concern, (4) molecular weight of the substance, and (5) various process parameters such as temperature, pressure, reactivity, and so forth. The CEI is the product of values assigned for each of the factors of concern using arbitrarily defined numerical scales.

Fault Tree Analysis (FTA):

A logic model that graphically portrays the combinations of failures that can lead to a specific main failure or incident of interest (Top event). This method using Boolean Logic

(And & Or logic gates). Assigning statistical values to each end point on a branch allows the calculation of risk.

Event Tree Analysis (ETA):

A logic model that graphically portrays the combinations of events and circumstances in an incident sequence. Assigning statistical values to each branch point (failure or condition) allows the calculation of composite risk starting from a defined initiating event.

Human Reliability Analysis (HRA) event tree:

A graphical model of sequential events in which the tree limbs designate human actions and other events as well as different conditions or influences upon these events. Assigning statistical values to each branch point (correct or incorrect performance of a step) allows the calculation of composite risk starting from a defined first step.

Hazard evaluation specialists should be allowed significant freedom to select the proper method(s) for a hazard evaluation. Since selecting an appropriate hazard evaluation technique is more an art than a science, there may be no “best” method for a particular application. This paper discusses a strategy for selecting a method that is likely to contribute to the success of a study.

Factors Influencing the Selection of Hazard Evaluation Techniques

Each hazard evaluation technique has its unique strengths and weaknesses. Understanding these attributes is prerequisite to selecting an appropriate hazard evaluation technique. The process of selecting an appropriate hazard evaluation technique may be a difficult one for the inexperienced practitioner because the “best” technique may not be apparent.

As hazard analysts gain experience with the various hazard evaluation methods, the task of choosing an appropriate technique becomes easier and somewhat instinctive. The thought process behind selecting hazard evaluation techniques is complex, and a variety of factors can influence the decision-making process. The table below lists six

categories of factors that analysts should consider when selecting a hazard evaluation technique for a specific application.

The importance that each of these categories has on the selection process may vary from facility to facility, company to company, and industry to industry. However, the following general observations about the relative significance of these factors should be true for nearly every situation.

Categories of factors that could influence the selection of hazard evaluation techniques

- Motivation of the study
- Type of result needed
- Type of information available to perform the study
- Characteristics of the analysis problem
- Perceived risk associated with the subject process or activity
- Resource availability and analyst/management preference

Self-Check 5	Written Test

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

Part-I say true or false (each 2 points)

1. A successful hazard evaluation program requires tangible management support; sufficient, technically competent people.
2. Each hazard evaluation technique has no its unique strengths and weaknesses.

. Answer the following question!

Note: Satisfactory rating 2 and 4 points Unsatisfactory below 2 and 4 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet .6 Performing systems' commissioning procedures with requirements.

2.6 Performing systems' commissioning procedures with requirements.

The procedures stated in this document cover the activities in preliminary tests and inspections, functional performance tests and the commissioning of newly completed installations and existing ones after major alteration. They are so compiled to facilitate the work of Project Building Services Engineer (PBSE) and Project Building Services Inspector (PBSI) in the following aspects with respect to testing and commissioning.

A. To vet and approve the test and commission procedures proposed and submitted by the Contractor;
B. To witness those test and commission procedures as specified; and
C. To accept the test and commission certificates and other supporting data.

This procedure is also intended to lay down the minimum testing and commissioning requirements to be carried out by the Contractor on a new Low Voltage Cubicle Switchboard Installation upon completion or on an existing Low Voltage Cubicle Switchboard Installation after a major alteration involving modification of the main bus bar such as upgrading, reposition and extension.

The commissioning process will also require you to confirm operational links to mechanical, fluid power, PLC control, services and external units/equipment, such as bus bars, sensors and actuators.

Performance criteria

You must be able to:

- work safely at all times, complying with health and safety and other relevant regulations and guidelines.

- follow all relevant setting up and operating specifications for the products or assets being configured.
- follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved.
- deal promptly and effectively with problems within your control and report those that cannot be solved.
- check that the configuration is complete and that the equipment operates to specification.
- complete all relevant documentation accurately and legibly.

Knowledge and understanding

You need to know and understand:

- the specific safety practices and procedures that you need to observe when commissioning electrical/electronic equipment (including any specific legislation, regulations or codes of practice for the activities, equipment or materials).
- the procedures to be carried out before starting work on the commissioning activities (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements).
- the specific health and safety precautions to be applied during the commissioning procedure, and their effects on others.
- hazards associated with carrying out electrical/electronic commissioning activities (such as dangerous voltages, stored charge, using damaged or badly maintained tools and equipment, not following laid-down commissioning procedures), and how to minimize them.
- the importance of wearing personal protective equipment (PPE) during the commissioning process, and where it can be obtained.
- how to obtain and interpret drawings, specifications, manufacturers' manuals, instructions (including BS and ISO schematics, IEE regulations, symbols and terminology).

- how to carry out currency/issue checks on the specifications you are working with.
- the equipment to be commissioned, its operating procedures and function.
- the checks to be carried out on the equipment prior to undertaking the commissioning operations (such as installation damage, contamination, level and alignment, security of fastenings, electrical connections are correct, moving parts are free from obstructions, all guards and safety devices are in place).
- the procedures to be applied during the commissioning activity.
- the importance of making `off-load' checks before running the equipment under power.
- the application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units).
- the importance of running the equipment at reduced power and/or in incremental stages to ensure satisfactory performance before applying full load checks.
- how to make adjustments to components/assemblies to ensure that they function correctly (such as trip speeds, pressure, timing, sequencing).
- the fault diagnostic techniques that can be used to help identify problems with the equipment.
- the uses of measuring equipment, such as multimeters, resistance.
- the procedure for obtaining replacement parts, materials and other consumables necessary for the commissioning.
- the methods and techniques used to dismantle equipment in order to replace defective components (such as isolation procedure,
- how to re-assemble the removed components and, where necessary, how to adjust them to meet the operating specification.
- the types of problem associated with the commissioning activity, and how they can be overcome.

- the organizational procedures to be adopted for the safe disposal of waste of all types of materials.
- the extent of your own authority, and whom you should report to if you have a problem you cannot resolve.

Self-Check 6	Written Test

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

Part I. say True or False(each 2 points)

- We must be able to work safely at all times, complying with health and safety and other relevant regulations and guidelines.
- We must not be able to follow all relevant setting up and operating specifications for the products or assets being configured.

. Answer the following question!

Note: Satisfactory rating 2 and 4 points Unsatisfactory below 2 and 4 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 7 Carrying out commissioning efficiently without unnecessary waste of materials or damage to apparatus and to the surrounding environment

2.7 Carrying out commissioning efficiently without unnecessary waste of materials or damage to apparatus and to the surrounding environment

Process Commissioning

Process commissioning can begin after precommissioning tests are complete and all identified issues are corrected. Plant equipment is placed into normal operation during this phase.

Process commissioning should not commence until the final checklist is reviewed and verified. This list will include:

- all safety equipment are in place and functional,
- emergency procedures are known,
- medical and first aid considerations have been arranged,
- all inspection equipment have been removed,
- test orifices and blanks are removed,
- vents and overflows are not obstructed,
- strainers are cleaned and replaced,
- methanol injection system for hydrate control,
- liquid seals are at correct levels,
- emergency and normal lighting systems are functional,
- rotating equipment guards are in place,
- source of ignition has been removed,
- access for emergency vehicles is clear, and
- all operations documentation are in place.
- The safe and environmentally friendly commissioning of any new asset should always

- be of the highest priority and integral with every check-sheet and procedure written
- during the preparation and execution of the commissioning process. The safety of
- personnel plus the environmental implication must always be the first considerations of
- any commissioning activity and as such the documentation therefore must address and
- Satisfy all the safety and environmental aspects at all times.

The safe and environmentally friendly commissioning of any new asset should always be of the highest priority and integral with every check-sheet and procedure written during the preparation and execution of the commissioning process.

The safety of personnel plus the environmental implication must always be the first considerations of any commissioning activity and as such the documentation therefore must address and satisfy all the safety and environmental aspects at all times.

Commissioning shall refer to the process whereby equipment and systems are verified to meet functional specifications as control and responsibility are transferred from project or non-operational status to operational status in the following types of projects;

Commissioning shall refer to the process whereby equipment and systems are verified to meet functional specifications as control and responsibility are transferred from project or non-operational status to operational status in the following types of projects;

- ✓ Major equipment assembly (new)
- ✓ Significant changes to operating facilities
- ✓ Start-up after major maintenance activity/rebuilds

A successful plant commission has at least three parts, which out which cannot be considered a success.

1. No Loss Time Accidents. No commissioning can be considered a success if it is not done safely.

Safety has to be stressed from the very beginning of the design, construction and commissioning.

2. No equipment damage – this function of many disciplines, design, construction and commissioning team.
3. On-test product within a reasonable period. Less than two days would be considered very good, seven days would be acceptable, and above fourteen days would be less than acceptable.

Self-Check 7	Written Test

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

I. say true or false (each 2 points)

1. Process commissioning should not commence until the final checklist is reviewed.
2. The safety of personnel plus the environmental implication must always be the first considerations of any commissioning activity.

. Answer the following question!

Note: Satisfactory rating 2 and 4 points Unsatisfactory below 2 and 4 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

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Controlling OHS hazards and risks (A hand book for workplace)

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LG #10	LO.3 Completion and reporting of commissioning activities

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Follow OHS risk control work measures and procedures.
- Document adjustment settings with established procedures.
- Make work site clean and safe with established procedures.
- Notify commissioning results and work completion to appropriate person with established procedures.

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

- Following OHS risk control work measures and procedures.
- Documenting adjustment settings with established procedures.
- Making work site clean and safe with established procedures.
- Notifying commissioning results and work completion to appropriate person with established procedures.

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 your trainer for assistance if you have hard time understanding them
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer 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

7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet1. Following OHS risk control work measures and procedures.

3.1. Following OHS risk control work measures and procedures.

- First identify the hazards
- Identify who might be harmed and how
- Evaluate the risk----identify and decide on the safety and health risk control measures
- Record who is responsible for implementing which control measures, and the timeframe
- Record the findings, monitor and review the risk assessment, and update when necessary

A workplace risk assessment is one of the key tools for improving occupational safety and health conditions at work. Thus it plays an important role in protecting workers and businesses, as well as complying with the laws in many countries. It helps everyone focus on the risks that really matter in the workplace – the ones with the potential to cause real harm.

In many instances, straightforward measures can readily control risks, for example providing drinking water to prevent dehydration, window blinds to reduce temperature gain in buildings, ensuring spillages are cleaned up promptly so people do not slip, or cupboard drawers are kept closed to ensure people do not trip. For most, that means simple, cheap and effective measures to ensure workers, businesses most valuable asset, are protected.

A well conducted workplace risk assessment will contribute to the protection of workers by eliminating or minimizing work related hazards and risks. It should also benefit businesses through better organization of working practices potentially increasing productivity.

The methodology described in this guide is not the only way to conduct risk assessments, there are other methods that work well, particularly for more complex risks and circumstances. However, we believe this method is the most straightforward for the majority of organizations, in particular small and medium sized enterprises.

In all cases, employers must ensure that workers and/or their representatives are fully involved in the process. They will have useful information about how the work is done that will make the assessment of the risk more thorough and effective. But remember, in many countries employers are responsible for seeing that the assessment is carried out properly.

When thinking about the risk assessment, remember:

- ✓ a hazard is anything that may cause harm, such as chemicals, electricity, working from ladders, an unguarded machine, an open drawer, demanding and stressful work, etc.;
- ✓ the risk is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.

Risk control measures

- ➢ Eliminate the hazard
- ➢ Substitute the hazard with a lesser risk.
- ➢ Isolate the hazard.
- ➢ Use engineering controls
- ➢ Use administrative controls
- ➢ Use personal protective equipment

Self-Check 1	Written Test

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

Part I say true or false(each 2 points)

1. A workplace risk assessment is one of the key tools for improving occupational safety and health conditions at work.
2. a hazard is anything that may cause harm, such as chemicals, electricity, working from ladders, an unguarded machine, an open drawer, demanding and stressful work, etc.
3. the risk is the chance, high or low, that somebody could be harmed by hazards.

. Answer the following question!

Note: Satisfactory rating 3 and 6 points Unsatisfactory below 3 and 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2.Documenting adjustment settings with established procedures.

3.2 .Documenting adjustment settings with established procedures.

This Annex contains examples of various documents currently in use for the establishment and implementation of the maintenance program described in this Manual. Each example is a copy of a document used by one particular Operating Organization. The document used by other Organizations may vary to accommodate their particular policies and practices; it is therefore possible that minor inconsistencies exist between the text of this Manual and individual examples and between examples.

Document control has been and continues to be a key element in ISO quality management system (QMS) standards. Without reliable control of procedures and records, a company's QMS integrity will fail as a practical business matter and as an easily audited computer system that enables compliance.

At the heart of both standards is the requirement to establish strict guidelines that govern the approach to document control procedures. The standards require a company to define everything from how documents are approved prior to issue to how obsolete documents are identified and controlled.

Companies that do not use electronic systems usually send or hand deliver these documents to the reviewer one after another until finalized. This serial process allows each reviewer to make changes or comments that subsequent reviewers can read.

If more than one person is to receive information at a time -- a parallel step-document-control personnel must manually make copies of the change package. In this manner, hard-copy documents, from first draft to the released version, are initiated, routed for modification and compiled into a completed change package -- a tedious task and a document- control challenge.

Upon the completion of this manual process, the final documentation often is duplicated in an electronic system. Electronic approval routes are then used to distribute the change package for final review and approval. During this routing, the document is "locked down" so that the first approver sees the same document as the final approver. Approval routes are usually predefined based on the company's document-approval matrix and cannot be modified during the approval process.

Document imaging and document management technologies are today collectively referred to as EDM. Document imaging refers to creating a digital representation of a paper document through the use of an input device, such as a scanner. Document management refers to the storage and retrieval of both static digital images and dynamic documents with a digital source such as Microsoft® Office documents. The incredible benefit of electronic document management over paper or conventional folder-based digital file storage is the ability to manage millions of documents and retrieve a specific document in just seconds.

These are the instructional materials that go with your product to help someone learn to properly use it or — in the case of physical products — even put it together.

The document contains:-

- Product name
- Model or type number
- Description of the main product elements
- Description of the user interface
- Safety warnings
- Installation instructions
- Description of how to use/operate the product
- Troubleshooting section and instructions on how to solve problems
- Maintenance information
- Repair information
- Technical specifications

Self-Check 2	Written Test

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

Part I say true or false(each 2 points)

- If more than one person is to receive information at a time -- a parallel step document-control personnel must manually make copies of the change package.
- Document management refers to the storage and retrieval of both static digital images and dynamic documents with a digital source such as Microsoft® Office documents.

. Answer the following question!

Note: Satisfactory rating 2 and 4 points Unsatisfactory below 2 and 4 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3. Making work site clean and safe with established procedures

3.3 Making work site clean and safe with established procedures

Keeping your job site in proper order can improve safety, morale, public relations, and efficiency. This involves proper storage, use, cleanup, and disposal of various construction-related materials.

A good housekeeping program should be well-planned, coordinated, and involve everyone on a job site. The best time to clean up is immediately after debris has been created since many accidents such as tripping or slipping are caused by unsafe conditions produced by poor housekeeping.

The essentials of good housekeeping are generally reduced to the principle of “a proper place for everything and everything in its proper place.” This implies a common-sense regimen on the part of all job site workers to maintain an orderly environment and a clean and sanitary job site.

Picture 1. Cleaning Work Site

Consider the following loss prevention recommendations when creating your housekeeping program:

Working Areas

- Provide safe access to the job site.
- Keep walking and working surfaces clean.
- Keep stairways, passageways, and gangways free of materials, supplies, and obstructions.
- Pick-up and place all debris or trash in its proper container.
- Hammer in, bend, or remove any nails protruding from scrap lumber. Cap or bend all exposed steel rebar ends.
- Remove any items that aren't being used from the work area and store them in their proper place.
- Keep lavatory and toilet facilities (stationary or portable) clean and sanitary.

Waste

- Place trash and recycling containers throughout the job site.
- Keep waste in metal cans or bins with self-closing covers and remove debris regularly.
- Never allow rubbish to fall freely from any level of the project. Use chutes or other approved waste-removal devices.
- Seal waste and product drums/containers tightly to reduce evaporation, spillage, and contamination.
- Ensure the disposal of scraps, waste, recyclables and surplus materials is in accordance with Federal regulations and local codes.
- Never dispose of any waste into storm or sanitary sewers.
- Frequently schedule the safe collection and removal of combustible waste.
- Lock and secure used oil containers and dumpsters.

Despite your best efforts to run a clean and safe job site, things can still go wrong. That's why it's important to safeguard your work area in other ways.

Self-Check 3	Written Test

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

Part I say true or false(each 2 points)

- Keeping your job site in proper order can improve safety, morale, public relations, and efficiency.
- A good housekeeping program should not be well-planned, coordinated, and involve everyone on a job site.
- Never allow rubbish to fall freely from any level of the project. Use chutes or other approved waste-removal devices.

. Answer the following question!

Note: Satisfactory rating 3 and 6 points Unsatisfactory below 3 and 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4. Notifying commissioning results and work completion to appropriate person with established procedures.

3.4 Notifying commissioning results and work completion to appropriate person with established procedures.

Commissioning report**:** Complete a final commissioning report and submitted to the Owner. The commissioning report should summarize all the tasks, findings, and documentation of the commissioning process.

General responsibilities of being a qualified Commissioning Firm include but not limited to the following activities:

A. Have primary responsibility for commissioning the project.
B. Provide the Contracting Agency an unbiased, objective and factual report of the Equipment/ Systems including installation, documentation, operation and performance.
C. Prepare a commissioning plan and commissioning specifications relating to the commissioning of all Equipment / Systems in the construction bid specifications (which has its basis of design in the Energy Audit Report) and as determined and requested by the Contracting Agency.
D. Prepare reports for commissioned Equipment / Systems.
E. Coordinate services to accomplish commissioning objectives. The Commissioning Firms' services in the commissioning of the building shall adhere to the definitions, requirements, and scope delineation outlined in the following publication which is incorporated herein by this reference:

Submit a commissioning schedule (e.g., scheduling of meetings, document due dates, and testing dates) to the Contracting Agency for review and approval by the design professional and Contracting Agency, within 30 calendar days of the commissioning plan's approval by the Contracting Agency or as required by Contracting Agency's schedule.

Meet with the Contracting Agency, design team, general contractor, and subcontractors to describe commissioning and to discuss individual roles and responsibilities for completing the commissioning process as specified in the commissioning plan and construction bid specifications. Schedule regular commissioning progress meetings with all participants. Include copies of minutes in the final commissioning report.

Submit a start-up plan to the Contracting Agency that establishes Equipment/ Systems formal start-up criteria and procedures. For Equipment/ Systems identified in the energy audit, and for which formal start-up is required, coordinate start-up with the general contractor and its subcontractors. Submit a start-up plan for Contracting Agency's approval.

Submit a final commissioning report to the Contracting Agency, detailing all commissioning services provided, upon completion of all commissioning services.

Final commissioning report is submitted to the contracting agency for review that include:-

a. The commissioning plan
b. The commissioning specifications for the equipment
c. The functional testing procedures for the equipment
d. The commissioning schedule
e. The inspection checklist
f. The commissioning issues/deficiencies log
g. The executive summary of the final commissioning report

Self-Check 4	Written Test

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

Part I say true or false

- Final commissioning report is submitted to the contracting agency for review.(4 points)

. Answer the following question!

Note: Satisfactory rating 2 and 4 points Unsatisfactory below 2 and 4 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

References

http://www.ilo.org

http://www.qualitymag.com

http://www.instrktiv.com

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AKNOWLEDGEMENT

We wish to extend thanks and appreciation to the many representatives of TVET instructors and who donated their time and expertise to the development of this TTLM.

We would like also to express our appreciation to the TVET instructors, TVET College/ Institutes, and Federal Technical and Vocational Education and Training Agency (FTVET) who made the development of this curriculum with required standards and quality possible.

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Answer key for self-check

Module Title: Commissioning Home/Office Electrical/Electronic Equipment

LO #1- Prepare to commission Home/Office Electrical/Electronic equipments

Self-Check -1	**Written Test**

Directions: Answer all the questions listed below.

I. Say True or False

1. F

2. T

3. T

4. F

5. T

Part II fill the blank space

1. List down some of the items related to health and safety!

- Emergency procedures.
- Location of first aid stations.
- Health and safety responsibilities, including those specified .
- Reporting of injuries, unsafe conditions and acts.
- Use of personal protective equipment.
- Right to refuse hazardous work.
- Hazards, including those outside own work area.
- Reasons for each health and safety rule.

2. Mention Job safety analysis!

- Select the job.
- Break down the job into a sequence of steps.
- Identify the hazards.
- Define preventive measures.
-

Self-Check 2	Written Test

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

Part I Fill the blank space

1. Mention risk assessment steps!

- Considering the context of the activity, material or equipment.
- Identifying the associated hazards and how they create an OHS risk in this situation.
- Considering any existing control measures and how they reduce the risk.
- Assessing the risk level as appropriate either overall or for components of the activity, material or equipment taking into account existing control measures.
- Identifying and considering additional control measures that will reduce the risk further.
- Assigning and scheduling the additional control measures.
- Assessing the final risk levee.
- Making a record of the above steps and keeping that record for five year.

2. When will a risk assessment required?

- When planning or proposing to change personnel, work processes, events and other activities.
- Before setting up and using a workplace.
- When planning changes to the workplace, such as new construction, alterations or renovations, repairs and maintenance.
- When designing, operating, maintaining, selling or disposing of plant whenever new information becomes available regarding work or equipment.

3.

- Hazard
- Risk
- Risk Assessment

Self-Check -3	Written Test

Directions: Answer all the questions listed below.

Answer the following questions by saying True or False.

- T
- F
- F
- T
- F

Self-Check -4	Written Test

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

I. Give short answer (each 3 points)

1. What are the benefits of hiring a safety and health appropriate personnel?
   - To increase in employee's safety knowledge
   - To enable employee to understand how to take any necessary preventive actions to avoid being hurt at work.
   - To make easy for employees to understand the rules and regulations to remain safe in the workplace.

2. List down the 3 ways that a safety consultant help business reduce workplace injuries!
   - Identifying compliance issues
   - Identifying gaps in training
   - Identifying gaps in processes

3. Write down the different types of safety audits!
   - general safety audits
   - site safety audits

- project audits
- contractor and supplier safety audits
  - unsafe
  - Safety consultant

Self-Check -5	Written Test

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

I. Answer the following questions by saying True or False

1. F
2. F
3. F
4. T
5. T

II. Short Answers

1. What is the difference between specification and technical data?

- A requirement specification is a documented requirement, or set of documented requirements, to be satisfied by a given material, design, product, service, etc. ... A data sheet describes the technical characteristics of an item or product, often published by a manufacturer to help people choose or use the products.

2. What is resistor?

- Resistor is a passive electronic component that opposes the flow of electric current.

3. How to identify a transistor?

- Transistors are identified by their numbers which commonly end with a prefix, for example a BC547

Self-check- 6	Written Test

Directions: Answer all the questions listed below.

1. Write the benefits of UPS
   - The most critical role of a UPS is that it maintains the supply of power in the situation when there is a load shedding or power blackout.

2.Write down the working principles of scanner

- it scans the original document optically, then transmits the optical image to a photoelectric converter to be converted into an analog electrical signal, and then converts the analog electrical signal into a digital electrical signal, and finally sends it to the computer through the computer interface.

3.How a printer operates?

- Principles of operation of printer.

  Paper is taken from the tray using a roller

  The drum (shown in yellow) is given a negative charge all over

  The laser uses a mirror to direct a beam onto the roller inverting the charge in the areas to be printed (*forming a negative of the document*)

  The drum is coated with toner which has a positive charge. The toner is then repelled where the negative charge remains

  The paper is moved using rollers & the drum rolls over the paper, transferring toner onto it

he paper is then fed through the *fuser* (two heated rollers) melting the toner onto the paper.

4.What is polishing?

- Polishing is one finishing loose abrasive process, used to generate surfaces with very high tolerances in geometry, surface integrity, and roughness characteristics.

5. What are microwaves?

- Microwaves are a form of electromagnetic energy, like light waves or radio waves, and occupy a part of the electromagnetic spectrum.

Self-Check- 7	**Written Test**

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

I. Write True if the statement is True and False if the statement False

1. F
2. T
3. F
4. F

Self-Check- 8	**Written Test**

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

1. What are the conditions that should be met to proceed work with electricity?

- Circumstances make it unreasonable to conduct work on dead circuit

- . It is reasonable given circumstances to work in or near live circuit
- . Suitable precautions are taken prior to work, where possible dead work is always preferable to live works.

2. What are the minimum safe isolation procedures that should be followed?

- Identify correct isolation point or device.
- Check condition of voltage indicating device
- Switch off installation/circuit to be isolated
- Verify with voltage indicating device that no voltage is present.
- Re-confirm that voltage indicating device functions correctly on proving unit.
- Lock-off device used to isolate installation circuit.

3. What does isolating voltage mean?

- ✓ Isolating voltage mean removing any supply voltage from the given circuit.

LO #2- Commission Home/Office Electrical/Electronic equipments

Self-Check 1	**Written Test**

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. F
2. T
3. T

4. T

5. F

Part II Answer the following questions

1. How to identify hazards?
   - Identifying hazards involves finding all of the foreseeable hazards in the workplace and understanding the possible harm that the hazards may cause.

2. Write down the steps of OHS risk control measures and procedures?

   ✓ Identify hazards
   ✓ Assess risks
   ✓ Control hazards and risks

3. What is the difference between reducing hazard risk and eliminating hazard risk?

   - Reducing hazard risk means minimizing hazard risk but eliminating hazard risk means removing the hazard risk.

• **Self-Check-2**	**Written Test**

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

Part I Fill the blank space

1. Potentiometer
2. Inductance meter
3. Ammeter
4. Capacitance meter

Self-Check 3	**Written Test**

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. T
3. F

Self-Check 4	Written Test

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

1. What are decision-making strategy to when we meet unexpected situations?

   - Think a minute — let your mind settle.
   - Assess the situation — gather information.
   - Consider alternatives — generate options.
   - Take a stand — follow-through with confidence

2. What are 3 simple tips for dealing with unexpected Situations?

   - Detach
   - Keep things in perspective
   - Mediate

Self-Check 5	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. F

Self-Check 6	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. F

Self-Check 7	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. T

LO #2- Completion and reporting of commissioning activities.

Self-Check 1	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. T
3. T

Self-Check 2	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. T

Self-Check 3	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T
2. F
3. T

Self-Check 4	Written Test

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

I. Answer the following questions by saying True if the statement is correct and False if the statement is incorrect

1. T