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Participant Handbook

Sector
Iron & Steel

Sub-Sector
**Steel, Sponge Iron, Ferro
Alloy, Re-Roller, Refractory**

Occupation
Electrical Maintenance

Reference ID: **ISC/Q1001, Version 1.0**
NSQF Level 3



**Fitter - Electrical
Assembly**

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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India.
If we have to move India towards
development then Skill Development
should be our mission. ”



Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

Iron & Steel Sector Skill Council

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: 'Fitter - Electrical Assembly' QP No. 'ISC/Q1001 NSQF Level 3'

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About this book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP) of Iron & Steel Industry. Each National Occupational (NOS) is covered across the Units.

Fitter is responsible for identifying the operations required to assemble various components of the machine and electrical panel by studying their engineering drawings, fitting different components of the machine to perform assigned task and testing the assembled machine. This book is all about training of operations required to assemble various components of the machine by studying their engineering drawings, fitting different components of the machine and testing the assembled machine under the proper supervision.

Key Learning Objectives for the specific NOS mark the beginning of the Units for that NOS. The symbols used in this book are described below.

Symbols Used



Key Learning
Outcomes



Steps



Exercise



Tips



Notes



Unit
Objectives

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5.1.2.2 Electric generators

An electrical generator converts mechanical energy to electrical energy, using electromagnetic induction.

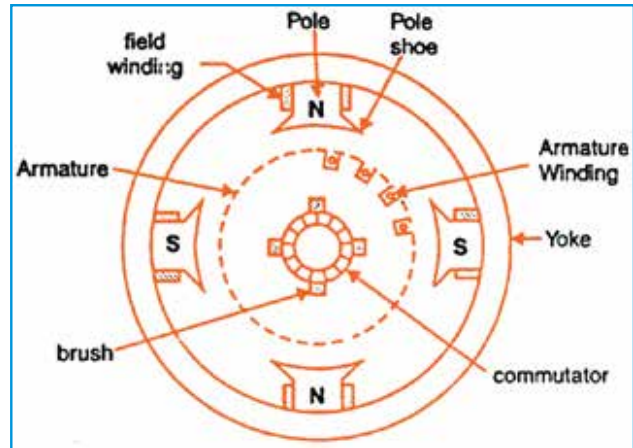
Generators are helpful electrical machines; they provide electrical power during electricity shutdown and avoid disruptions in regular activities at work and home. According to use

of generators in different applications, *5.1.7 Main components of a generator*

they are available in different physical and electrical configurations.

The main components of an electric generator are as follows:

1. **Yoke:** Yoke of DC generator is made of cast iron and serves two functions,
 - It holds the magnetic pole cores of the generator and acts as cover of the generator.
 - It carries the magnetic field flux.
2. **Pole of generator:** The pole coils are wound around the pole core. These are a simple coil of insulated copper wire, which placed over the pole.
3. **Armature of DC generator:** Armature core carries armature winding and provide low reluctance path to the magnetic flux. Since DC generator generates direct current but in the armature current generated is alternating in nature, this is the reason that armature is made of circular laminated sheets and in cylindrical shape.
4. **field winding:** Armature windings are wound over the armature in form of flat rectangular coils.
5. **Commutator:** The commutator is an essential component of dc generator. It collects current coming from armature and pass to the load in form of direct current.
6. **Brushes of generator:** The brushes are made of carbon. Their shape is in rectangular block. They collect current from commutator segments.
7. **Bearing:** In small generators, ball bearings are used and in heavy duty dc generator, roller



bearings are used. Always lubricate the bearing properly for smooth operation and longer life of machine.

How does a generator work?

An electric generator converts input mechanical energy into electrical energy as the output.

A generator does not actually generate electrical energy; it uses the mechanical energy supplied to it and forces the movement of electric charges. This flow of electric charges generates electric current which is supplied by the generator.

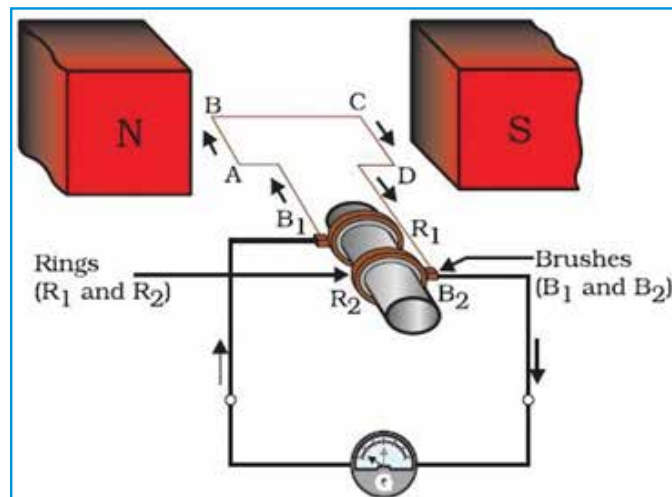


Fig.5.1.8 working of generator

5.1.2.3 Pumps

A pump moves or sucks fluids whether liquid or gas by some mechanical action. Pumps perform mechanical work in form of moving fluid when starts by an electric power.

Basic types of pumps

1. **Vacuum Pumps:** Vacuum pumps expel the gas from a sealed volume of gas leaving partial vacuum behind.



Fig.5.1.9 vacuum pump

2. **Water Pumps:** Water pumps pump water. They pump water from the ground and used in pressure tanks within the location.



Fig.5.1.10 water pump

3. **Trash Pumps:** Trash pumps are used to pump wastewater. They are usually used to pump bathroom waste for disposal.



Fig.5.1.11 trash pump

4. **Hydraulic:** Pumps: These pumps are utilized in hydraulic drive systems. These pumps come in hydrostatic or hydrodynamic type.



Fig.5.1.12 hydraulic pump


Unit 5.2: Using of tools



Unit Objectives




At the end of this unit, you will be able to:





1. Know about different hand tools
2. Know about how to use tools properly

5.2.1 Using of tools

TOOL	USAGE	IMAGE
Screwdrivers	<p>Screw driver is a tool used for driving in or removing a screw. To use a screwdriver:</p> <ul style="list-style-type: none"> • Choose the correct size and tip of the screw driver, so that it fit into fastener's head easily. • If required make a starter hole by drill or pressing the tip into object. • Insert tip of screwdriver into the screw head and turn its handle clockwise direction, then apply pressure over the handle so that tip can inserted into the handle properly. • Continue turning the screwdriver firmly and check that that screw is in straight position while inserting in the material. 	

TOOL	USAGE	IMAGE
<p>Pliers</p> <ul style="list-style-type: none"> • Combination • Slip joint • Side cutters • Long nose 	<p>Pliers are used for gripping, twisting and cutting wires. To use pliers</p> <ul style="list-style-type: none"> • Determine the type of pliers required. • Make any adjustments if required for slip joint • Adjust locking pliers before using. • Press the handles of plier and close its jaws for holding the object. • To turn the object, rotate the tool as required. • Keep the fingers away from the jaws for safety. 	
<p>Hammers</p> <ul style="list-style-type: none"> • Ball peen hammer • Engineers hammer • Soft faced • Rubber mallet • Dead blow • Brass • Leather 	<p>Hammers are used to drive nails, fit parts, forge metal, and break apart objects. To use a hammer:</p> <ul style="list-style-type: none"> • Select the weight of the hammer appropriate to the fastener to be struck. • Make tight grip at the hammer handle lower half, then swing the hammer slowly and hit the fastener head squarely. • Do not strike your hand by the hammer head or handle. • Wave the hammer with extra power to strike the fastener head. • Continue the process of striking the fastener head to drive it into the material. 	

TOOL	USAGE	IMAGE
<p>Hacksaws</p>	<p>A hacksaw is a fine-toothed saw for cutting metal, plastic and wood. To use a hacksaw :</p> <ul style="list-style-type: none"> • Install a blade by turning the adjuster on the handle or frame until spigots inserted properly in the holes at each end of the blade. • Ensure that blade teeth are pointed in opposite direction from the handle. • Tight the adjuster. • Gently fix object in the vice has to be cut. • Place the saw's central teeth on the object line have to be cut and then make the stroke on the line by pushing the saw. • Continue the cut and ensure that end of the object has been cut by the saw, cannot break due to unsupported weight. • Keep hands away from the blade teeth for safety. 	
<p>Files</p> <ul style="list-style-type: none"> • Flat • Half round • Triangular • Knife edge • Round • Square • Half 	<p>Files are used to remove the burrs and sharp edges on the work piece created while sawing and drilling. For finishing a project, use of file is the first step.</p>	
<p>Chisel</p> <ul style="list-style-type: none"> • Flat Chisel • Side Cut • Cow Mouth • Round Nose • Diamond Point • Cross Cut 	<p>Chisel is used for cutting rods, sheet metal and other workpieces of same type. The flat chisel is the used widely. It has a broad cutting edge which is slightly round in shape so that corners of chisel do not stuck inside the metal.</p>	

TOOL	USAGE	IMAGE
Pipe Wrench	<p>The pipe wrench is an adjustable wrench used for turning soft iron pipes and fittings. Its adjustable jaws design permits it to lock in the frame in a way that if any forward pressure applied on the handle it pulls the jaws together. Its teeth are angled in the direction of turn which is digging into soft pipe. Don't use them on hard steel hexagonal nuts because they can damage the nut head. It can also be used to break the bolt.</p>	
Try Square	<p>Try square is a tool used to check and mark right angles in constructional work.</p>	
Divider <ul style="list-style-type: none"> • Simple Firm Joint Divider • Firm Joint 	<p>Dividers are drawing instruments that are used to measure distances, transfer lengths from one drawing to another and draw circles.</p>	
V Block	<p>V-Blocks are precision metalworking jigs usually used to grip round metal rods or pipes during drilling and milling work. They made of a rectangular steel or cast iron block with a 90-degree channel rotated 45-degrees from the sides and form a V-shaped look in the top. A small groove is cut in the bottom of the "V". They have the screw clamps for holding the work.</p>	

6.8.1.1 Mechanical installation - steps

1. Foundation: Ensure that base for motor is level and free from any vibrations. Generally for 100 HP (75kW) motor, foundation made of concrete is preferred. Selection of motor base largely depends on the building floor capacity or nature of soil, where motor has to install. When constructing the motor base; remember the usage of motor whether will be run on rated full load torque or not.

2. Types of bases

a) Slide Rails

When motor is driven by pulley system, mount the motor on slide rails. The lower part of the pulley belt should be pulling the motor to prevent slippage of belt during motor operation and also prevent the belts to damage bearing shoulders during operation.

The nearest rail to the drive pulley is positioned like that the adjusting bolts are between the motor and the driven machine.

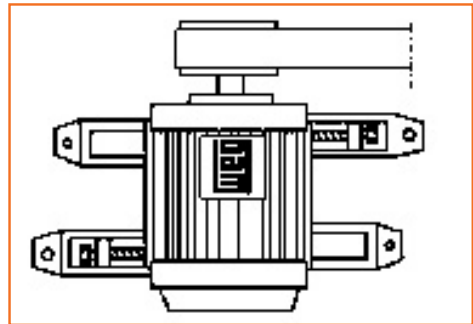


Fig 6.8.1 Slide rail

b) Foundation Studs

In flexible coupling, motor is anchored directly to the base with foundation studs. This type of coupling is very economical and doesn't permit any thrust above the bearings.

Take care that foundation studs should never be painted and nor rusted as both obstruct the bonding of the concrete, and create loose foundation.

c) Metallic Base

The metallic base saves the motor from any distortion if motor is not secured on a flat foundation.

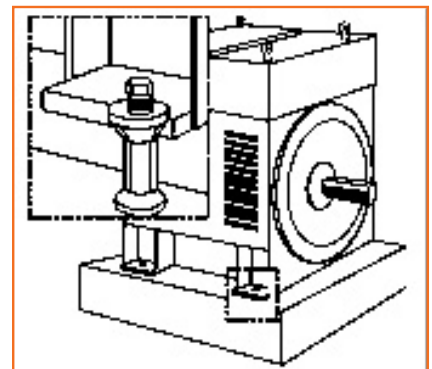


Fig 6.8.2 Foundation Studs

Metallic base adjusts the height of the motor shaft end with the machine shaft end.

After the base has been levelled, check that studs are tightened, the metal base and studs are

Unit 7.1: Testing of material

Unit Objectives

At the end of this unit, you will be able to:

1. Know about quality check and testing process

7.1.1 Quality checking of end product

Steps

Step 1: Measure the specifications of the finished part and confirm conformance according to CP/WI

Step 2: Use measuring devices like gauges, micrometers, vernier callipers and any other measuring equipment for measuring specifications.

Step 3: Perform basic testing and inspection tests for quality check.

Step 4: Note down the observations found during inspection and identify workpieces which are meeting the required standards.

Step 5: Separate the defective pieces into two categorie

- workpieces which can be repaired or modified again
- woekpieces which cannot repair

We will study about inspection tests in next unit

Notes



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