Electrical Systems Safety

6077A NUE505A

Capstone Tutorial

August 2009

Name:..... **Date:**.....

You must satisfactorily complete this tutorial before you will be permitted to undertake the practical testing for this Unit.

Task 1.

You are required to isolate a 230 Volt 15 Amp socket outlet in a lunch room at a section of a large industrial plant.

Complete the JSA for this isolation procedure.

JOB SAFETY ANALYSIS					
Page No		**Date**		**Contract / Job Description**	
Foreman		**Job No**			
Phone		**Location**			
Attendees					
Site Supervisor		**Ambulance Station**		**Emergency Pick Up Point**	
Phone		**Emergency Phone**			

	Safety Steps	Potential Hazards	Actions To Deal With Potential Hazards	Procedures
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Task 2.

Identify the pins on the Clipsal 66P550 Three-phase Socket Outlet shown below in Figure 1.

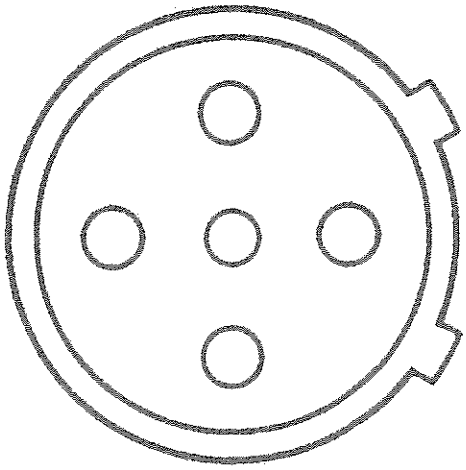

Figure 1

Task 3.

Complete Table 1 for each MEN earthing system listed.

Installation	No of Phases	Active Conductor Size	Cable Type	Cable Insulation	Maximum Demand	Route Length	Consumer Mains Installation
1	One				63 A	15 metres	Unprotected other than aerial
2	Three				47 A	17 metres	Unprotected aerial
3	Three	2 x 25 mm^2 per phase			55 A	45 metres	Unprotected underground

Determine the conductor size required for each of the three installations above

Conductor or distance	Clause No	Instal 1	Instal 2	Instal 3
Main neutral conductor				
MEN link				
Main earthing conductor				
Water pipe equipotential bonding conductor				
Switchboard surround bonding conductor				
Separation distance required for the earth stake from a 25 mm water supply pipe				

Table 1

Task 4.

The following values of earth conductor resistance was measured during a test of a given electrical installation and recorded in Table 2.

Determine the maximum resistance value permitted for the route lengths nominated in Table 2.

Test	Conductor Size (mm^2)	Conductor Length (m)	Measured Value (Ω)	Maximum Permitted Value (Ω)	Pass	Fail
Main earth conductor	16 mm^2	27 metres	0.02 Ω			
Equipotential bonding conductor	10 mm^2	15 metres	0.025 Ω			
Switchboard surround conductor	50 mm^2	1.8 metres	0.03 Ω			
Telephone and telecommunications earthing bonding conductor	4 mm^2	18 metres	0.07 Ω			

Table 2

Show any calculations that are needed to determine if the measured values are within the permitted values.

Task 5.

The following values of protective earth conductor resistance was measured during a test of a given electrical installation and recorded in Table 3.

Determine the maximum resistance value permitted for the route lengths nominated in Table 3.

Circuit Under Test	Earth conductor CSA	Circuit Protective Device Rating		Measured Earth Resistance	Maximum Earth Resistance Permitted	Result	
		Fuse	Circuit Breaker			Pass	Fail
Power 1 (Length 25 m)	**2.5 mm^2**		**20 A**	**0.18 Ω**			
Power 2							
Light 1 (Length 37 m)	**1.5 mm^2**		**16 A**	**0.488 Ω**			
Light 2							
Range (length 28 m)	**2.5 mm^2**		**32 A**	**0.28 Ω**			
HWS							
Sub-mains							
Equipotential Bonding		N/A	N/A				

Table 3

Task 6.

The following values of earth-loop impedance were measured and recorded in Table 4 for a given electrical installation. Determine if the measured values comply with the requirements of the Wiring Rules.

Circuit Under Test	Conductor CSA (mm^2)		Circuit Protective Device Rating (A)		Measured Earth Loop Resistance (Ω)	Maximum Earth Loop Resistance Permitted (Ω)	Result	
	Active	Earth	Fuse	Circuit Breaker			Pass	Fail
Power 1	2.5	2.5	20		1.47			
Power 2	4.0	2.5		20 A Type C	0.58			
Light 1	2.5	2.5	16		1.72			
Light 2	4.0	2.5		10 A Type C	2.1			
Range	16	6		63 A Type D	0.24			
HWS	4	2.5		25 A Type D	0.49			
Sub-mains	10	4		40 A Type C	0.37			

Table 4

Task 7.

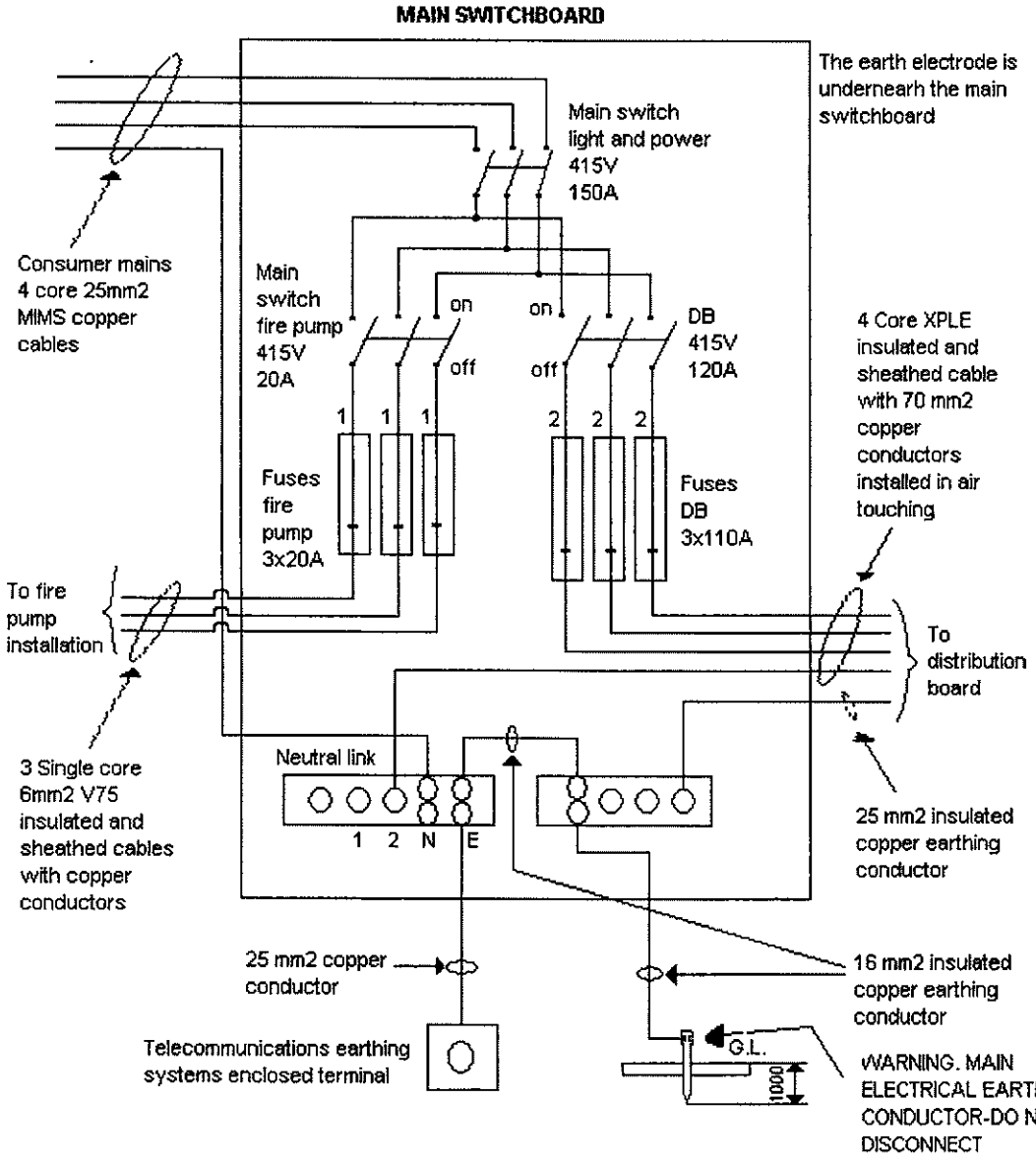

Figure 2

The drawing in Figure 2 shows the MAIN SWITCHBOARD of an industrial installation originating at the consumers mains and contains contraventions to the Wiring Rules (and/or Service and Installation Rules of NSW).

It supplies a distribution board having a connected load with a calculated maximum demand of 100 A per phase and an automatically controlled 3 phase fire pump motor having a current rating of 20 A per phase.

The multi-core MIMS cables are installed spaced from the wall.

Assume the MIMS cables are earthed in accordance with the Wiring Rules and are capable of maintaining supply to the equipment even when exposed to fire and mechanical damage.

All fuses shown are HRC type.

List **FIVE different defects** together with the contravened Wiring Rules Clause/Table number in Table 5

Defect Details	Wiring Rule Clause/Table No

Table 5