

TEST 2: Page 78 – Page 86

1. **100 mm** is the maximum electrical trade size of intermediate conduit.
2. **Electrical permit** is a type of permit needed before starting any installation work, alternation, repair or extension on any electrical system.
3. The PEC is intended for **mandatory** applications by government bodies exercising legal jurisdiction over electrical installation.
4. Equipment for installation in hazardous locations must be tested and approved for use according to the classification of the hazardous involved. These are divided into **3 groups**.
5. Individual branch circuits using type FCC (Flat Conductor Cable) shall have ratings not exceeding **30 A**.
6. **USE type conductor** is applicable for underground service entrance conductors.
7. If there are three wires of 150 mm² connected to one terminal entering a cabinet or a switchboard, the bending space at each terminal shall NOT be less than **250 mm**, provided the conductors do not enter or leave the enclosure through the wall opposite its terminals.
8. A clearance of not less than **26 mm** shall be secured between bare current carrying metal parts and any metal surface of an auxiliary gutter.
9. No box shall have an internal depth of less than **12 mm**.
10. Which of the following electrical conductor has the highest resistance? (3.5 mm², 8.0 mm², **2.0 mm²**, 5.5 mm²). *Note: Resistance is inversely proportional to the cross-sectional area of the conductor wire.*
11. **Pendant** is a device or equipment which is suspended from overhead either by means of a flexible cord carrying the current, or otherwise.
12. In the schedule of loads for motor circuits, which of the following is NOT included? (Type of motor, **Motor's manufacturer**, Motor as numbered or identified in the power layout, number of phase).
13. **45 A** is the allowable ampacity of THW insulated copper conductor with an area of 8.0 mm² and exposed to an ambient temperature of 30°C.
14. For two conductors inside the conduit, the ampacity of the conductors shall be derated to what percent? (90%, 80%, 70%, **none of these**). *Note: Derating is applicable only if there are 3 or more wires.*
15. Electrical equipment may best be mounted on a concrete wall by using an **expansion bolt**.
16. What is the neutral load of a range that has a demand load of 10.4 kW? **Ans. 7.28 kW**
Neutral Load = 70% of demand load = (0.7)(10.4 kW) = 7.28 kW
17. If the project is extensive and requires more time for checking and for computations of fees, the issuance of the electrical permit need not be issued immediately. However, the delay shall not be longer than **5 working days**.
18. Splices in ground conductors shall be as few as practicable and shall be attached so as to withstand a pull test of **890 Newtons**.
19. **Class II** locations are hazardous because of the presence of combustible dust.
20. For an ambient temperature of 30°C, a THW insulated copper conductor with a cross sectional area of 3.5 mm² and buried underground has a **30 A** ampacity.
21. All located parts within **1,800 mm** of the lighting protection system shall be bonded thereto.

22. **Continuous duty** is an operation at substantially constant load for an indefinitely long time.
23. Transformer exceeding 112.5 kVA, shall not be located within **300 mm** from combustible materials of the building.
24. Electrodes of iron or steel plates shall be at least **6.4 mm** in thickness.
25. The frame of the vehicle-mounted generator shall be permitted to serve as the grounding electrode for a system supplied by a generator located on the vehicle under the following conditions:
- ✓ The vehicle of the generator is bonded to the vehicle frame.
 - ✓ The generator supplies only equipment located on the vehicle.
 - ✓ The non-current carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.
26. The minimum insulation level for the neutral conductors of a solidly grounded system shall be **600 V**.
27. The following copper conductors have the same cross sectional area but are made up of different number of strands. Which one has the least resistance to AC current?
- ✓ 19-strand conductor
 - ✓ **Single solid conductor**
 - ✓ 7-strand conductor
 - ✓ 37-strand conductor
28. Advisory rules in the Code are characterized by the use of the word "**should**".
29. **Air terminal** is a device capable to drawing lightning discharge to it in preference to vulnerable parts of the protected area.
30. Conductors normally used to carry current shall be of **copper** unless otherwise provided in the PEC.
31. Light fixtures suspended from the ceiling by chains should be wired so that the **wires do not support the fixture**.
32. **Fixed appliance** is fastened or otherwise secured at a specific location.
33. **110 A** is a standard rating of an inverse time CB.
34. Aerial cable under non-metallic extensions shall have a clearance of not less than **50 mm** from steel structure members or other conductive materials.
35. Above ground tanks containing liquids at atmospheric pressure are considered to be protected against lightning if the following requirements are met. Which one is NOT included?
- ✓ The metal roof shall have a minimum thickness of 4.8 mm
 - ✓ The roof shall be welded, bolstered or riveted to the shell
 - ✓ All pipes entering the tank shall be metallicly connected to the tank at the point of entrance
 - ✓ **None of these**
36. According to Republic Act No. 184, a licensed Master Electrician may operate and tend generator rated up to **750 volts**.
37. A heavy duty lamp holder shall have a rating not less than **660 watts**.
38. In rigid metal conduit wiring, conduits shall be supported at least every **3,000 mm**.

39. Conductors used in open wiring method within **2,000 mm** from the floor shall be considered exposed to physical damage.
40. Heating elements of cables shall be separated at least **200 mm** from the edge of outlet boxes and junction boxes.
41. Auxiliary gutters shall NOT contain more than **30** current carrying conductors at any cross section.
42. Circuits rated from 201 to 400 A requires a minimum insulation resistance of **25,000 ohms**.
43. No over-current device shall be connected in series with any conductor that is **intentionally grounded**.
44. Which of the following size of single-phase transformer is NOT standard? (**30 kVA**, 37 ½ kVA, 75 kVA, 20 kVA).
45. For the purpose of lightning protection, a high rise building is a building with a height over **23 m**.
46. Branch circuits are classified according to the maximum **setting of the over-current device**.
47. Cable tray shall NOT be used in **hoistways**.
48. **TW type** of electrical conductor has a trade name of "**moisture resistant thermoplastic**".
49. **Reactor** is a device used for the purpose of minimizing irregularities in the flow of welding currents.
50. For all land-based electrical installation under the scope of the PEC, where should an electrical permit be filed? **Ans. Local Building Office**

TEST 4: Page 95 – Page 103

1. For each 2-wire laundry branch circuit, a feeder load of NOT less than **1,500 VA** shall be included.
2. The computed load for the branch circuit installed to supply exterior signs and outline lightning shall be computed at a minimum of **1,200 VA**.
3. Non-metallic boxes shall be permitted only with **concealed knob & tube wiring, non-metallic sheathed cable, and open wiring on insulators**.
4. A building or other structure serve shall be supplied by only one service drop EXCEPT for:
 - ✓ Multiple occupancy building
 - ✓ Fire pumps
 - ✓ Emergency electrical system
 - ✓ **All of these**
5. Air terminals exceeding 600 mm in height shall be supported at a point NOT less than **one-half** of its height.
6. At least **1 entrance** shall be provided to give access to the working space about electrical equipment.
7. Sheet steel metal boxes over 1,640 cm³ in size shall be made from steel NOT less than **1.35 mm** thick uncoated.
8. For straight pulls, the length of the pull box shall NOT be less than **48 times** the outside diameter over sheath of the largest shielded or lead covered conductor or cable entering the box.
9. **Armored cable**, a type of cable, is a fabricated assembly of insulated conductors enclosed in a flexible metal sheath.
10. **Health care facilities** circuits shall NOT be grounded.
11. An attachment plug and receptacle shall be permitted to serve as the disconnecting means for single phase room air conditioner rated 250 V or less, if the manual controls of the room air conditioner is readily accessible and located within **1,800 mm** distance from the floor.
12. There are situations where deviations from the code requirements are necessary. Before such deviations are made, there must be a written permission from **Board of Electrical Engineering**.
13. Circuits with rigid non-metallic conduit approved for direct burial and placed under streets, hi-ways, roads, alleys, driveways and parking lots shall have a minimum cover distance of **600 mm**.
14. Energized parts of generators operated at more than **50 V** to ground shall NOT be exposed to accidental contact where accessible to unqualified persons.
15. **Raintight**, a test condition, is so constructed or protected that exposure to a beating rain will not result in the entrance of water.
16. The cross sectional area in square millimeters of a conductor shall be durably marked on the surface repeated at intervals NOT exceeding **600 mm**.
17. Motor circuit switches **shall be** permitted to be of the knife switch type.

18. The following are common splicing rules EXCEPT one. Which one is this?
- ✓ A splice must provide a path for the current to pass through.
 - ✓ A joint must be mechanically as strong as the wire itself.
 - ✓ All splices must be mechanically and electrically secured by means of a solder.
 - ✓ **Wires of the same size should be spliced together in line.**
19. For watercrafts, electrical permit should be filed in **Maritime Industry Authority**.
20. Reconnection by the supplier of electrical energy in cases where service has been cut-off due to non-payment of bills shall NOT require a new certificate of inspection provided the period of cut-off is NOT more than **one year**.
21. Liquidtight flexible non-metallic conduit shall NOT be used where the voltage of the contained conductors is in excess of **600 V**.
22. Roofs with a series of parallel ridges shall have air terminals along the end ridge at intervals NOT exceeding **7,600 mm**.
23. Communication wires and cables shall be separated at least **300 mm** of minimum distance from the service drops of electric light and power conductors, which are not installed in a raceway or in cable.
24. Service entrance using copper conductors shall have sufficient capacity and shall NOT be smaller than **8.0 mm²**.
25. **Class III, Division 1** – hazardous locations in which easily ignitable fibers or material producing combustible flyings are handled, manufactured or used.
26. The rating of the over-current device shall NOT be less than the non-continuous load plus a percentage of the continuous load. **Ans. 125%**
27. A **40 or 50 A** branch circuit shall be permitted to supply cooking appliances that are fastened in place in any occupancy.
28. An over-current device shall be connected at the point where the conductors to be protected **receives its supply**.
29. Service entrance cables shall be supported by straps or other approved methods within **300 mm** of every service head.
30. Type MC cable shall be supported and secured at intervals NOT exceeding **1,800 mm**.
31. **Outlet** is a point in a wiring system at which current is taken to be used in some equipment.
32. Live vegetation or trees **shall NOT be** used for support of overhead conductor spans.
33. **Bare conductor** is a conductor having no covering or electrical insulation.
34. Type FC cables shall have the temperature rating durably marked on the surface at intervals NOT exceeding **600 mm**.
35. **Class II, Division 2** – hazardous locations where combustible dust is not normally in the air in quantities sufficient to provide explosive or ignitable mixtures, and dust accumulations are normally insufficient with the normal operation of electrical equipment.
36. The clearance from the top of a switchboard to a ceiling which is combustible shall NOT be less than **1,000 mm**.
37. Overhead conductors used in festoon lighting shall NOT be less than **3.5 mm²**.
38. Conductors used in lightning protection system maybe coursed through air without support for a distance of **900 mm**.
39. In concealed knob and tube wiring, the clearance to be maintained between conductors is **76 mm**.

40. A run of type IGS cable between pull boxes or terminations shall NOT contain more than the equivalent of **4 quarterbends**.
41. For optional calculation in dwelling units, the first 10 kW shall be computed at 100% while the remainder is at **40%**.
42. Operation of equipment in excess of normal, full load rating or of a conductor in excess of rated ampacity. **Ans. Overload**
43. Branch circuit larger than **50 A** shall supply only non-lighting outlet loads.
44. When circuit breakers are installed in enclosed switchboards, they are usually derated to **80%**.
45. Which of the following statement is NOT true?
- ✓ Electrical equipment and wiring not mentioned in the code shall require a special permission prior to installation.
 - ✓ **Extended use of temporary installation shall not require a new approved electrical permit.**
 - ✓ An application of inspection shall be filed with the government agency concerned before a preliminary and or final inspection is done.
 - ✓ A copy of the electrical permit shall be posted or kept at the job site at all times, until the approval of the work have been made.
46. Fixed electric space heating loads shall be computed at **100%** of the total computed load.
47. The powers of the Board are vested in them by whose authority? **Ans. Under RA 7920**
48. The current carrying conductors in cable bus shall have insulation rating of **70 °C** or more.
49. In hazardous location, the use of non-metallic conduit shall be permitted provided it is buried NOT less than **600 mm** below the earth level.
50. Open conductors shall be separated from open conductors of other circuits by NOT less than **100 mm**.

TEST 6: Page 113 – Page 121

1. Where flexible tubing is used to encase the conductors, the tubing shall extend from the last insulating support to NOT less than **6.4 mm**.
2. Metal raceways, enclosures, frames and other non-current carrying metal parts of electric equipment shall be kept at least **1,900 mm** distance from lightning rod conductors.
3. Where no standard electrical equipment of the exact size or rating is available and the next larger size is neither available the next smaller size or rating maybe used provided a special permission is obtained from **Electrical Inspector**.
4. Instruments, pilot lights, potential transformers and other switchboard devices with potential coils shall be supplied by a circuit that is protected by a standard over-current device rated up to **15 A**.
5. **Guy** is a wire or other mechanical member having one end secures and the other end fastened to a pole maintained under tension.
6. Below the factors that affect the ampacity of an electrical conductor EXCEPT one. Which one is this?
 - ✓ **Insulation resistance**
 - ✓ Length of the conductor
 - ✓ Conductor material
 - ✓ Cross-sectional area of the conductor
7. For circuits over 600 V nominal, conductors shall NOT be bent to a radius less than **12 times** the diameter for shielded or lead covered conductors.
8. Which of the following statement about over-current devices is NOT correct?
 - ✓ It shall be located where they will not be exposed to physical damage.
 - ✓ It shall be readily accessible.
 - ✓ **It can be located inside clothes closets.**
 - ✓ In a multi-family dwelling, each occupant shall have ready access to over-current device protecting his occupancy.
9. Which of the following statements is NOT true?
 - ✓ Conductors in raceways shall be continuous between outlets.
 - ✓ Metal raceways, boxes, cabinets and fittings shall be grounded.
 - ✓ Metal or non-metallic raceways shall be continuous between cabinets, boxes or other enclosures.
 - ✓ **Raceway shall be used as a means of support for other raceways.**
10. For receptacle outlets, each single or each multiple receptacle on one strap shall be considered NOT less than **180 VA**.
11. Corner joints on a gutter shall be made tight, where the assembly is held together by rivets or bolts. The spacing shall NOT be more than **300 mm**.
12. **360 degrees** is the total number of mechanical degrees that a PVC conduit run maybe bent between pull joints (pull boxes, junction boxes or utility boxes).

13. The minimum size of wire used in electrical wiring is the former #14 AWG. Under the SI standard in the PEC, what is the diameter of this wire? (1.2 mm, 2.0 mm, 1.5 mm, **1.6 mm**).
14. **Pull box** is a box with a blank cover which is inserted in one or more runs of raceway to facilitate pulling of the conductors.
15. The neutral conductor from the neutral point of the transformer or generator to its connection point to the grounding impedance shall be **fully insulated**.
16. The sum of the cross sectional area of all conductors in a wireway must NOT exceed **20%** of the cross-sectional area of the wireway.
17. Circuit containing electric discharge lighting transformer exclusively shall NOT be rated in excess of **30 A**.
18. For ranges of 8.75 kW or more in rating, the minimum branch circuit required shall be **40 A**.
19. Lighting fixtures shall be wired with a fixture flexible cord with a cross-sectional area of NOT less than **0.75 mm²**.
20. If the setting of over-current device in a circuit ahead of equipment is 60 A, the minimum required grounding conductor using copper is **5.5 mm²**.
21. Mineral insulated metal sheathed cable shall be permitted in any of the following installations EXCEPT one. Which one is this?
 - ✓ For control circuits
 - ✓ Where exposed to oil and gasoline
 - ✓ For feeder circuits
 - ✓ **Where exposed to corrosive atmosphere**
22. Conductors which run above the top level of a window shall be permitted to be less than 1,000 mm but in no case shall be less than **300 mm**.
23. For barber shops and beauty parlors, the general lighting load per square meter of area shall be **24 watts**.
24. Liquidtight flexible non-metallic conduit shall be permitted to be used: **for direct burial, where flexibility is required, in exposed or concealed locations**.
25. Outlet boxes **shall NOT be** used as a sole support for ceiling fans.
26. Flexible metal conduits must NOT be used in **wet locations, hoistways, and storage battery rooms**.
27. For 25 to 50 A circuits, the minimum insulation resistance is **250,000 ohms**.
28. **75°C** is the maximum operating temperature of type THWN conductor.
29. **Counterpoise** is a conductor encircling a building and interconnecting all ground terminals.
30. The conductor connecting the neutral point of the transformer or generator to the grounding impedance **shall be permitted to be installed in a separate raceway**.
31. The total load on over-current device located in a panel board shall NOT exceed to **80%** of its rating.
32. For underground feeder and branch circuits, **UF type** of conductors shall be used.
33. **Guy insulator**, an insulating element, generally of elongated form with transverse holes or slots for the purpose of insulating two sections of a guy or provide insulation between structure and anchor.
34. **30 A** is the ampacity of a 5.5 mm² TW copper conductor.

35. A two wire DC system supplying premises wiring shall be grounded EXCEPT,
- ✓ A system equipped with ground detector and supplying only industrial equipment in limited areas.
 - ✓ A system operating at 50 V or less between conductors.
 - ✓ A rectifier device DC system supplied from an AC system.
 - ✓ **All of these**
36. **Class I, Division 1** – hazardous location in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions.
37. Switches are operated vertically rather than horizontally. The upward position of the handle shall mean **switch-on position**.
38. The use of surface non-metal raceway is NOT permitted in all those mentioned below EXCEPT one. Which one is this?
- ✓ **Dry locations**
 - ✓ Where subject to severe physical damage
 - ✓ Where the voltage is over 300 V
 - ✓ Where concealed
39. The branch circuit rating shall NOT be less than **100%** of the non-continuous load.
40. For installation consisting of not more than two 2-wire branch circuits, the service disconnecting mains shall be rated NOT less than **30 A**.
41. What is the lowest dielectric strength of transformer oil, which is acceptable to the PEC?
Ans. 25,000 volts
42. Wireways shall be supported at intervals NOT to exceed **1,500 mm**.
43. For a dwelling unit having a floor area NOT more than 50 square meters shall be permitted to have a single 20-A, 2-wire branch circuit provided the total load shall NOT exceed **3,680 VA**.
44. For show window lighting, a load of NOT less than **600 VA** shall be included for each linear meter of show window.
45. The maximum setting of the ground fault protection of equipment shall be **1,200 A**.
46. **Busway** is a grounded metal enclosure containing a factory mounted, bare or insulated conductors, which are usually copper, or aluminum bars, rods or tubes.
47. Flat Conductor Cable (FCC) system shall NOT be used in the locations enumerated below EXCEPT one. Which one is this?
- ✓ Locations where subject to corrosive vapors
 - ✓ **Damp locations**
 - ✓ Residential buildings
 - ✓ Outdoors
48. Type MI cables shall be securely supported at intervals NOT exceeding **1,800 mm**.
49. The grounding impedance for neutral system shall be installed between the **grounding electrode and system neutral**.
50. In any watercraft, receptacle outlets operating at **50 V** or more shall have a grounding pole.

TEST 8: Page 130 – Page 138

1. Space heating cables shall be secured at intervals NOT exceeding **200 mm**.
2. A run conduit between outlets, between fittings, between outlet and fitting shall NOT contain more than the equivalent of **4 quarterbends**.
3. **Switchgear** is a general term covering an assembly or assemblies of devices for the interruption, control and metering of electric power.
4. Thermoplastic insulated fixture wires shall be durably marked on the surface at intervals NOT exceeding **600 mm**.
5. The average distance between down conductors in a lightning protection system shall NOT exceed **30 m**.
6. Type AC cable shall NOT be permitted to be used:
 - ✓ In storage battery
 - ✓ On cranes or hoists
 - ✓ In motion pictures
7. **Earth** shall NOT be used as the sole equipment grounding conductor.
8. **Service entrance cable** is a single conductor or multi-conductor assembly provided with or without an overall covering, primarily used for services.
9. Fixture wires shall NOT be smaller than **0.75 mm²**.
10. Standard locknuts and **bushings** shall NOT be used as a bond for the service entrance raceway.
11. Transformers that contain liquid that will burn shall be installed only in approved vaults and shall also comply with the following conditions EXCEPT one. Which one is this?
 - ✓ Ample ventilation shall be provided for the continuous removal of flammable gases.
 - ✓ Vent openings shall lead to a safe location outside the building.
 - ✓ All vent ducts and openings shall be of sufficient areas to reliable explosion pressures within the vault.
 - ✓ **There shall be robust door between the vault and any non-hazardous location.**
12. Flat cable assemblies shall have conductors of **5.5 mm²** special stranded copper wires.
13. **Jumper** is a short length of a conductor used to make a connection between terminals or around a break in a circuit.
14. The surface non-metallic raceway may NOT be used in the following locations EXCEPT one. Which one is this?

- ✓ **In dry locations**
 - ✓ Where concealed
 - ✓ Where subject to severe physical damage
 - ✓ In hoistways
15. For bare metal parts, busbars, etc of opposite polarity held free in air shall maintain a minimum spacing of **19 mm** for voltages rated NOT over 250 V.
 16. Type IGS cable is using a dry kraft paper tape and an SF₆ gas. What do you mean by SF₆?
Ans. Sulfur hexafluoride
 17. **Hazardous locations** do NOT allow the installation of PVC rigid conduits.
 18. Flat cable assemblies shall NOT be installed:
 - ✓ In hoistways
 - ✓ In any hazardous locations
 - ✓ Outdoors
 19. Ground connections shall be made at approximately every other steel column around the perimeter of the building and shall NOT be more than **18 m** apart.
 20. For school buildings, the general lighting load is **24 VA** per square meters.
 21. **Type AC** is fabricated assembly of insulated conductors in a flexible metallic enclosure.
 22. Splices and **taps** in messenger wire shall be made by approved methods.
 23. A storage battery supplying emergency lighting and power shall maintain NOT less than 87.5% of full voltage at total load for a period of at least **1.5 hours**.
 24. **Portable appliance** is an appliance which can easily be moved from one place to another in normal use.
 25. The feeder demand factor for three kitchen equipment other than dwelling kitchen equipment shall be **90%**.
 26. To provide for small appliance load in a dwelling unit, the feeder should be computed at **1,500 watts**.
 27. Cables operated at over **2,000 V** shall be shielded.
 28. The nearest ground terminal shall be NOT less than **600 mm** from the foundation wall.
 29. **Feeder** is the circuit conductors between the service entrance equipment or isolated generating plant and the branch circuit overload device or devices.
 30. Conductors shall be securely attached to the buildings using fasteners. Fasteners shall be spaced NOT more than **900 mm**.
 31. The minimum diameter of air terminal used at the top of a heavy duty smoke or vent stacks shall be **15 mm**, exclusive of the corrosion protection.
 32. **Locknuts** are used on conduits and are located inside and outside of the box.
 33. No parts of cord connected fixtures, hanging fixtures or pendants shall be located within a zone measured **900 mm** horizontally from a bathtub rim.
 34. Busbars shall be copper having a minimum conductivity of **97%**.
 35. **75°C** is the temperature rating of THW insulation.
 36. Individual open conductors and cables other than service entrance cables shall NOT be installed within **3,100 mm** of every grade level.
 37. An insulated grounded conductor of 14 mm² or smaller shall be identified by a continuous **white or naturally gray** outlet finish along its entire length.

38. Messenger supported wiring is permitted only in **industrial establishments** where maintenance personnel service the system.
39. In damp or wet locations, boxes and fittings should be properly placed or insulated to prevent **water from entering the box or fitting**.
40. Equipment having an open circuit voltage exceeding **300 V** shall NOT be installed in dwelling occupancies.
41. Concealed knob and tube wiring conductors shall be rigidly supported on knobs NOT more than **1,300 mm** of minimum distance apart.
42. **Split knobs** are used to support the conductor in the open wiring method.
43. The minimum size of type IGS cable shall be **125 mm²**.
44. Watercraft's switchboards shall be provided with a clear working space of at least **1,000 mm** at the front.
45. For grounding electrode to which portable or mobile equipment system neutral impedance is connected, shall be isolated from the ground by at least **6,000 mm** from any other system or equipment grounding electrode.
46. **Copper** metal is the best conductor of electricity.
47. Incandescent lamp fixtures shall be marked to indicate the allowable wattage of lamps. The markings shall be permanently installed in letters at least **6.4 mm** high.
48. If the duty cycle of a motor-generator arc welder is 100%, the supply conductors shall NOT be less than **100%** of its rated primary nameplate current.
49. Most wires used in residential house wiring are usually insulated by **thermoplastic**.
50. Open wiring on insulators shall be permitted for wiring systems of **600 V** or less.

TEST 10: Page 147 – Page 155

1. Stage equipment like footlights, border lights and others shall be so arranged that no branch circuit supplying such equipment will carry a load exceeding **20 A**.
2. Metal poles **shall be** permitted to be used to support lighting fixture and enclosed supply conductors.
3. **Rigid non-metallic conduit** raceway method is NOT allowed to be used in a hazardous location.
4. **1 or more sides** of any pull box shall be removable.
5. Dimmers installed in ungrounded conductors shall be protected by OCPD NOT exceeding **125%** of their rating.
6. Mobile home service equipment shall be rated NOT less than **100 A**.
7. The branch circuit conductors that supply one or more units of data processing systems shall have an ampacity NOT less than **125%** of the total connected load.
8. **Class III** – locations which are hazardous because of the presence of easily ignitable fibers of flyings.
9. Where nails or screws are used to mount knobs, they shall be of a length sufficient to penetrate the wood to a depth equal to at least **one-half** the height of the knob.
10. Explosion hazards exist due to the presence of the following material EXCEPT one. Which one is this?
 - ✓ Combustible dust
 - ✓ Flammable vapors
 - ✓ Flammable liquids
 - ✓ **Carbon dioxide gas**
11. Metal clad cables shall be supported and secured at intervals NOT exceeding **1,800 mm**.
12. The ampacities of type UF (underground feeder) cable shall be that of the **60°C** conductors.
13. Some of the principal factors that affect the operating temperature of a cable are the following EXCEPT one. Which one is this?
 - ✓ Voltage
 - ✓ Ambient temperature
 - ✓ **Ventilation**
 - ✓ Load current

14. Communication wires and cables shall have a voltage rating of NOT less than **300 V**.
15. Self-excited generators supplying power to organs shall have a potential of NOT more than **15 V**.
16. **90°C** is the temperature rating of THHN insulation.
17. All AC squirrel cage motors and synchronous motors with autotransformer starting shall have an over-current protective device using inverse time circuit breaker with a maximum setting of **200%** of its full load current rating.
18. Rosettes for use with conduit boxes or raceway shall have bases high enough to keep wire and terminals at least **10 mm** from the surface wired over.
19. No motor circuit in any watercraft shall have conductors less than **2.0 mm²**.
20. Sizes of building wires manufactured in the Philippines are standardized in square millimeters. What is the area of copper conductor, which is next larger than 8 mm²? **Ans. 14 mm²**.
21. Flexible cords or data processing cables used to connect computer units **shall be approved** as part of the system.
22. Branch circuits to receptacles under raised floors in computer rooms shall be wired with: **EMT, IMC, and AC cable**.
23. As to the general rule, floating buildings shall be supplied by **1 set** of feeder conductors from their service equipment.
24. Which of the following electric wires has the highest ampacity? (5.5 mm², 8.0 mm², 30 mm², **50 mm²**)
25. Indoor antennas and indoor lead-in conductors shall NOT be run nearer than **50 mm** to conductors of other wiring systems in the premises.
26. The ampacity of the neutral conductor of a dual voltage feeder shall be **100%** of the ampacity of the ungrounded conductors.
27. According to the PEC, the minimum insulation level for neutral conductors of residential installations, which have solidly grounded system, shall NOT be less than **300 V**.
28. Exit lights on watercrafts shall be provided at each point. The word "EXIT" shall be red letters NOT less than **50 mm** high.
29. The nominal voltage used in elevator, dumbwaiter, escalator and moving walk driving machine motors, machine brakes and motor-generator sets shall NOT exceed **600 V**.
30. **Traveling cable** is a cable made-up of electric conductors which provides electrical connection between an elevator or dumbwaiter car and fixed outlet in the hoistway.
31. **23 kg** is the minimum weight of a fixture that requires a support that is independent of the outlet box.
32. For single phase AC or DC motors supplied by a two wire, single phase AC or DC with one conductor grounded. How many overload units shall be required? **Ans. (1) in the ungrounded conductor**
33. **500,000 ohms** is the insulation resistance acceptable by the PEC for 600-V circuits consisting of 2.0 mm² conductor.
34. Each patient bed location shall be provided with a minimum of **4 receptacles**.
35. Open conductors on insulators shall be separated at least **50 mm** from metal raceways, piping or other conducting materials.
36. The nominal gas pressure used in type IGS cable shall be **138 kPa**.
37. **15 mm** is the smallest size of EMT (electrical metallic tubing).

38. The use of non-metallic raceway shall be permitted in **dry locations only**.
39. Metal clad cables shall be permitted for installations in the following locations EXCEPT one. Which one is this?
- ✓ Signal circuits
 - ✓ Branch circuits
 - ✓ **Direct burial in the earth**
 - ✓ Aerial cable
40. One set of service entrance conductors shall be permitted to supply more than **1 set** of service equipment.
41. **Rigid non-metallic conduit** is known in the field as PVC.
42. Concealed knob and tube wiring shall be supported within **150 mm** of each side of each tap or splice.
43. A 15-A or a 20-A branch circuit shall be permitted to supply lighting units and other utilization devices. The rating of any one cord and plug connected appliance shall NOT exceed **80%** of the branch circuit rating.
44. Receptacles located on stages in theaters shall NOT exceed **80%** of their ratings for continuous duty loads.
45. Lighting fixtures exposed to cleansing water in agricultural buildings shall be **watertight**.
46. **Intermediate metal conduit** is a metal raceway of circular cross section with integral or associated couplings, connectors and fittings approved for the installation of electrical conductors.
47. Rigid metal conduit and intermediate metal conduit when used underground shall have a minimum burial of **150 mm**.
48. Storage batteries used, as source of power for emergency system shall maintain a voltage applied to the load without falling below **87.5%** of normal value.
49. Driven rods maybe used as a grounding electrode provided the driven depth shall NOT be less than **2,450 mm**.
50. **Raceway** is an enclosed channel designed expressly for holding wires, cables or busbars with additional functions as permitted.

TEST 12: Page 164 – Page 172

1. The bonding conductor used in agricultural buildings shall be copper, insulated, covered or bare, NOT smaller than **8.0mm²**.
2. In any watercraft, the motor circuit shall have an ampacity of NOT less than **100%** of the motor's full load current rating.
3. The largest size of electrical metallic tubing is **100 mm**.
4. The overload relay used to protect each motor-compressor set shall be selected to trip at NOT more than **140%** of the motor-compressor rated load current.
5. Lamp protection shall be provided by elevation of at least **2 m** from the normal working surface.
6. Type UF cable shall NOT be used **as service entrance**.
7. Where "U" pulls are made on the pull box, the distance between each raceway entry inside the box and the opposite wall of the box shall NOT be less than **6 times** the trade diameter of the largest raceway in a row.
8. Reference ambient temperature for explosion proof electrical equipment shall be **50°C**.
9. **Arc welding** is a process wherein coalescence is produced by heating with an electric arc with or without the application of pressure and with or without the use of filler metal.
10. The use of underground feeder cables may NOT be used in the following conditions EXCEPT one. Which one is this?
 - ✓ Embedded in concrete
 - ✓ Hazardous location
 - ✓ **Direct burial**
 - ✓ Theaters
11. Faceplates of insulating materials shall be non-combustible and NOT less than **2.5 mm** in thickness.
12. Conductors supplying two or more motors shall have an ampacity equal to the sum of the FLA rating of all motors plus **25%** of the highest motor FLA in the group.
13. **White** color identifies the grounded conductor of a branch circuit.
14. **Rosette** is an enclosure of porcelain or other insulating material, fitting with terminals and intended for connecting the flexible cord carrying a pendant to the permanent wiring.
15. Receptacles installed for the attachment of portable cords shall be rated at NOT less than **15 A, 250 V**.

16. Motors with a marked service factor of less than 1.15 shall have an overload protection equal to **115%** of the motor's FLA.
17. Cables and cords supplied through plugging boxes shall be of **copper**.
18. Which of the following statements is NOT correct?
 - ✓ Over-current devices shall be located where they will not be exposed to physical damage.
 - ✓ Over-current devices shall be readily accessible.
 - ✓ **Over-current devices may be located inside clothes closets.**
 - ✓ In a multi-family dwelling, each occupant shall have ready access to all over-current devices protecting his occupancy.
19. A conductor or group of conductors, in switchgear assemblies which serves as a common connection for two or more circuits. **Ans. Bus**
20. The ampacity of capacitor circuit conductors shall NOT be less than **135%** of the rated current of the capacitor.
21. The alternate or back-up source of power in a hospital shall have a capacity to sustain its connected loads for a minimum of **1.5 hours**.
22. Cable trays shall NOT be used in **hoistways**.
23. The load for the required branch circuit installed for the supply of exterior signs or outline lighting shall be computed at a minimum of **1,200 VA**.
24. The usual function of a disconnect switches in high voltage circuits is to **isolate from energized buses, equipment which are not in service**.
25. Pendant conductors where not cabled and longer than **900 mm** length shall be twisted.
26. The ampacity of the phase conductors from the generator terminals to the first over-current device shall NOT be less than **115%** of the nameplate current rating of the generator.
27. What is the maximum number of conductors permitted in a wireway at any cross-section, signal circuit or starter-control wires are not included? (**30 conductors**, 50 conductors, 40 conductors, 25 conductors)
28. Each motor shall be provided with **only 1** disconnect.
29. Energized parts of a generator operated at more than **50 V** to ground shall NOT be exposed to accidental contact where accessible to unqualified persons.
30. A hoisting and lowering mechanism equipped with a car or platform which moves in guides in a substantially vertical direction and which serves two or more floors of a building or structure. **Ans. Elevator**
31. **Extension cord** is an assembly of a flexible cord with an attachment plug on one end and a cord connector on the other.
32. Any box NOT over **1,640 cm³** in size, intended for mounting in closed building construction shall be affixed with anchors or clamps as to provide a rigid and secure installation.
33. In battery rooms with alkaline batteries, the shelves shall be lined with steel sheet NOT less than **75 mm** thick.
34. **Flashover** is a disruptive discharge around or over the surface of a solid or liquid insulator.
35. Emergency lighting of **10 lux** shall be provided in exit paths from all areas of attended stations.
36. An overheated cord often indicates **corroded terminals and defective cord**.

37. Individual arrester grounding conductors shall NOT be smaller than **14 mm²** copper.
38. **Lamp** is a generic term for an artificial source of light.
39. Cable bus shall be securely supported at intervals NOT exceeding **3,600 mm**.
40. Snap switches used with open wiring on insulators shall be mounted on insulating material that separates the conductors at least **13 mm** from the surface wired over.
41. The usual nameplate data on DC motors include the following EXCEPT one. Which one is this?
- ✓ Manufacturer's name
 - ✓ **Rated frequency**
 - ✓ Rated voltage
 - ✓ Rated speed
42. Vertical runs of wireways shall be securely supported at intervals NOT exceeding **4,500 mm**.
43. Size 0.75 mm² fixture wire has an ampacity of **6 A**.
44. Type MI cable shall NOT be used **where exposed to destructive corrosive conditions**.
45. Each receptacle for DC plugging boxes shall be rated at NOT less than **30 A**.
46. Insulated ground conductor of 14 mm² or smaller shall be identified by a continuous white outer finish along its entire length or another color which is **natural gray**.
47. Metal covers for boxes shall be lined with firmly attached insulating material NOT less than **0.80 mm**.
48. Electrical non-metallic tubing shall NOT be used where the voltage is over **600 V**.
49. Busways shall be marked with: **voltage rating, manufacturer's name, and current rating**.
50. The system neutral conductor shall NOT be connected to ground EXCEPT
- ✓ When the generator frame is not grounded
 - ✓ **Through the grounding impedance**
 - ✓ Through a grounding transformer
 - ✓ When a ground fault is very common

TEST 14: Page 181 – Page 189

1. When thermal overload relay are used for the protection of a three-phase induction motor, their primary purpose is to protect the motor in case of **sustained overload**.
2. In type AC cable, all bends shall be made so that the cable will not be damage and the radius of the curve of the inner edge of any bend shall NOT be less than **5 times** the diameter.
3. Non-metallic sheathed cable shall be supported within **300 mm** from every cabinet, box or fitting.
4. **230 VAC** is the nominal supply voltage specified by the PEC for residential homes.
5. Messenger supported wiring shall NOT be used in **hoistways**.
6. Temporary electrical power and lighting installations shall be permitted for a period NOT to exceed **90 days** for Christmas decorative lighting, carnivals and similar purposes.
7. **Type THHN** conductors is NOT applicable on wet locations.
8. **Impulse** is a surge of unidirectional polarity.
9. For each small appliance branch circuit, the feeder load shall be **1,500 VA** per 20 A circuit.
10. The electrical plans for residential house include the following items EXCEPT one. Which one is this?
 - ✓ **Substation plan**
 - ✓ Location plan
 - ✓ Floor plan showing location of service
 - ✓ Layout of wiring plan for general lighting and receptacle outlets
11. Tools and portable hand lamps likely to be used in wet and conductive locations shall NOT be required to be grounded where supplied through an isolating transformer with an ungrounded secondary of NOT more than **50 V**.
12. The minimum size of branch circuit capacity to supply laundry receptacle outlets shall be **20 A**.
13. Conductors in open wiring on insulators shall be rigidly supported within **150 mm** from a tap or splice.

14. Main and equipment bonding jumper shall of **copper**.
15. The minimum insulation level for neutral conductors of solidly grounded system shall be **600 V**.
16. For class II lighting materials, the minimum diameter of a solid copper air terminal shall be **12.7 mm**.
17. **Bonding connection** between conductive or inductive metal object in an element of a lightning protection system to accomplish electrical continuity.
18. The grounding electrode conductor shall be: **copper, copper-clad-aluminum, and aluminum**.
19. Mats of insulating rubber or other suitable floor insulation shall be provided for the operator where the voltage to ground exceeds **150 V**.
20. **1 or more** 20-A branch circuit shall be provided for all receptacle outlets for the small appliance load.
21. For a one family dwelling unit having an initial load of 10 kVA or more, the minimum service entrance capacity shall be **60 A**.
22. Flexible cords used in locations where there is a lot of flying flint or fibers shall comply with the following EXCEPT one. Which one is this?
 - ✓ It shall be approved for use in locations which are vapor-filled.
 - ✓ It shall contain in addition to the conductors, a grounding conductor.
 - ✓ **It shall be of type approved for extra hard usage.**
 - ✓ It shall be provided with suitable seal to prevent the entrance of dust.
23. **Load center** is a point at which the load of a given area is assumed to be concentrated.
24. The workspace about electrical equipment shall be adequate to permit at least **90 degrees** opening of doors or hinged panels.
25. The multiplying factor for determining the size of branch circuit protection for non-time delay fuse is **300%**.
26. For banks, the general lighting load shall be computed at **28 per square meters** of the floor area.
27. In dwelling units, the computed lighting and small appliance load above 120,000 VA shall be computed at what demand? **Ans. 25%**
28. Which of the following statements is NOT one of the primary objective of the PEC?
 - ✓ To establish electrical work standards
 - ✓ To establish basic material qualities
 - ✓ To ensure safety in using electricity
 - ✓ **None of these**
29. The code has been approved and adopted by the Board, PRC. What does the acronym PRC stands for? **Ans. Professional Regulation Commission**
30. **Wireways** are sheet metal troughs with hinged or removable covers for housing and protecting electric wires and cables and which conductors are laid in place after this object has been installed as a complete system.
31. Portable appliances equipped with proper cord and plug caps and NOT more than **1,200 VA** maybe installed without an electrical permit.
32. Which of the following is not a standard content of an electrical plan?
 - ✓ Location plan

- ✓ Legend and general notes
- ✓ **Schedule of maintenance**
- ✓ Specifications

33. When installing cables or raceway type wiring method parallel to the framing members such as joists, rafters or studs, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is NOT less than **50 mm** of distance from the nearest edge of the framing member.
34. Which of the following is NOT a standard ampere rating of a fuse?
(60 A, 125 A, 45 A, **55 A**)
35. Cabinet and cutout boxes shall have an air space of at least **25 mm** between any energized metal parts of enclosed fuses and the door.
36. Auxiliary gutter shall be supported throughout its entire length at intervals **1, 500 mm**.
37. A lighting and appliance branch circuit panelboard is one having more than **10%** of its over-current device rated 30-A or less.
38. Open wiring on insulators shall be permitted on systems of up to **600 V**.
39. Conductors in concealed knob and tubing wiring shall maintain a clearance of NOT less than **76 mm** between conductors.
40. The minimum size of wire used in electrical wiring is the former #14 AWG. Under the metric system shown in the PEC, the diameter is **1.6mm**.

$$\#14 \text{ AWG} = 2.0 \text{ mm}^2$$

$$A = \frac{\pi d^2}{4} \text{ thus, } d = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4(2)}{\pi}} = 1.6 \text{ mm}$$

41. Non-metallic sheathed cable shall be secured in place at intervals NOT exceeding **1,300 mm**.
42. Motor A has a full load current of 8-A and motor B 10-A. What is the ampacity of the feeder conductor supplying these two motors? **Ans. 20.5 A**
- Feeder ampacity = Sum of motors' FLA + 25% of largest motor FLA
 = 8 + 10 + (0.25)(10)
 = 20.5 A
43. The bending radius of type SNM cable shall NOT be less than **5 times** the diameter of the cable.
44. Flexible metallic tubing shall NOT be used in lengths longer than **1,800 mm**.
45. Size 1.25 mm² fixture wire has an ampacity of **8 A**.
46. Each transformer up to 600 V nominal shall be protected by an individual over-current device on the primary side at NOT more than **125%** of the rated primary current of the transformer.
47. Outdoor lighting fixtures and associated equipment **shall be** permitted to be supported by trees.
48. Rosettes shall be rated at 660 W, 250 V with a maximum current rating of **6 A**.
49. Heating cables shall be furnished complete with factory assembled non-heating leads at least **2,100 mm** in length.
50. Conductors supplying one or more motor-compressors with or without additional loads shall have an ampacity NOT less than the sum of the rated load plus **25%** of the highest motor-compressor rating in the group.

TEST 16: Page 198 – Page 206

1. Capacitors containing more than **11 liters** of flammable liquid shall be encased in vaults or outdoor fenced enclosures.
2. Wiring methods/materials allowed by the Code for gasoline stations include all the following EXCEPT one. Which one is this?
 - ✓ Type MI cable with approved terminal fitting
 - ✓ Threaded steel intermediate conduit
 - ✓ **Rigid non-metallic conduit**
 - ✓ Threaded rigid metal conduit
3. A main bonding jumper shall be a: **bus, screw, or wire**
4. What does the symbol consisting of rectangle with solid shading indicate? **Ans. Lighting panelboard**
5. The ampacity of conductors supplying therapeutic equipment shall NOT be less than **100%** of the current rating of the equipment.
6. For 800 A circuits, the minimum insulation resistance shall be **5,000 ohms**.
7. Branch circuits shall be classified according to the maximum permitted **ampere rating**.
8. Medium voltage cable shall be permitted for installation on the following EXCEPT one. Which one is this?
 - ✓ Where installed in cable trays
 - ✓ **Where exposed to direct sunlight**
 - ✓ Power systems up to 35,000 volts in dry locations
 - ✓ Power systems up to 35,000 volts in wet locations
9. Each autotransformer up to 600 V shall be protected by an individual over-current device rated NOT more than **125%** of its rated full load current.

10. Each of the three 3.5 mm² TW copper conductors are in a conduit has an ampacity of 20 A. If there will be six of them in the conduit, what will be the ampacity of each conductor?

Ans. 16 A

New ampacity = Ampacity x Derating of six wires = 20 x 80% = 16 A

11. Branch circuit conductors supplying a single motor-compressor shall have an ampacity NOT less than **125%** of either the motor-compressor rated load or the branch circuit selection current, whichever is larger.
12. **30 A** is required to supply a fixed lighting load of 21.5 A used at continuous duty.
Ampacity = 125% of load current = (1.25)(21.5) = 26.875, use a 30-A branch circuit
13. Potential transformers installed indoors or enclosed shall be protected with **primary fuses**.
14. Which of the following is NOT a standard size of disconnect? (30 A, 60 A, **50 A**, 100 A)
15. A disconnecting means shall be provided in each ungrounded conductor for each capacitor bank and shall NOT be less than **135%** of the rated current of the capacitor.
16. If a 460-V switchboard has exposed parts on one side and grounded parts or concrete on the opposite side, what working clearance between the two sides is permitted by the Code?
Ans. 1,100 mm
17. Cells in rubber or composition containers shall require no additional insulating supports where the total nominal voltage of all cells in series does NOT exceed **150 V** level of voltage.
18. **12 A** is the maximum load of a 15-A circuit breaker protecting a branch circuit that supplies a continuous load.
Load = 80% of rating = (0.8)(15) = 12 A
19. Aircraft energizers shall be so designed and mounted that all electric equipment and fixed wiring shall be at least **460 mm** above floor level.
20. Each patient bed location where in patient care is provided shall be supplied by at least **2 branch circuits**.
21. Generators compartments shall be lined with galvanized steel, NOT less than **0.40 mm** thick.
22. For a rigid steel conduit of trade diameter 50 mm, the field bend shall be so made that the radius of the inner edge shall NOT be less than **300 mm** of radius for conductors without lead sheathed.
23. For all deck or floor plans, the standard scale to be used is **1:100**.
24. In locations where flammable anesthetics are employed, the entire area shall be considered hazardous location which shall extend upward to a level **1,500 mm** above the floor.
25. As a rule, branch circuits shall NOT be supplied by an **autotransformer**.
26. **Motor operation sequence switch** is a multi-contact switch, which fixes the operation sequence of the major device during starting and stopping or during other sequential switching operations.
27. Circuits from portable switchboards directly supplying equipment containing incandescent lamps of NOT ove 300-W shall be protected by over-current device having a setting of **20 A**.
28. The Electrical Code requires that electrical plans and drawings shall be drawn on sheets of the following standard size. Which one is NOT considered standard?

✓ 600 mm x 900 mm

- ✓ **217 mm x 279 mm**
- ✓ 760 mm x 1000 mm
- ✓ 500 mm x 760 mm

29. **Sparkover** is a disruptive discharge between electrodes of a measuring gap.
30. The chassis-grounding terminal of the battery shall be bonded to the vehicle chassis with a copper conductor of **8.0 mm²** size or its equivalent.
31. The length of the cord from the face of the attachment plug cap to the point where the cord enters the mobile home shall NOT be less than **6 m**.
32. Non-metallic sheathed cables shall be supported within **200 mm** of a non-metallic outlet box without cable clamps.
33. A test lamp using an ordinary bulb is used to test the **ground check**.
34. Air conditioning load has a demand load of **100%**.
35. **5 sets** of the complete electrical plans and specifications signed and sealed by a PEE shall be submitted, as one of the requirements in filling for an electrical permit.
36. If there will be six or more 2-wire branch circuits for a one family dwelling unit, the minimum service entrance capacity shall be **100 A**.
37. **Device** is a unit of an electrical system which is intended to carry but not utilize electric energy.
38. Service entrance cables shall be supported at intervals NOT exceeding **760 mm**.
39. **Fuse** is an over-current device with a circuit opening fusible part that is heated severed by the passage of over-current through it.
40. **10 A** is the maximum size of lighting load that can be connected to a 20-A single phase branch circuit supplying a fixed appliance load of 7-A. *Note: The additional load shall NOT exceed 50% of the branch circuit rating.*
- Thus, load = (0.50)(20) = 10 A
41. If an electrician does not understand the instruction that were given by the supervisor, which of the following is the best for him to do?
- ✓ **He asks that the instruction be repeated and clarified**
 - ✓ He does the job the way he thinks best
 - ✓ He works out the solution to the problem himself
 - ✓ He gets one of the other electricians to do the job
42. The branch circuit load for drying equipment is the larger of either the VA rating of the nameplate or **5,000 VA**.
43. For hallways of **3,000 mm** or more in length, at least one receptacle outlet shall be installed.
44. The minimum headroom of working space about service equipment, switchboards, panelboards, etc. shall be **1,900 mm**.
45. The equipment-grounding conductor of a branch circuit shall be identified by a continuous **green** color.
46. **Connected load** is the sum of the continuous ratings of the load consuming apparatus connected to the system or any part thereof.
47. An outlet box should be fastened to a concrete wall by the use of **expansion bolts**.
48. A **30 A** branch circuit shall be permitted to supply fixed lighting units with heavy-duty lampholders.

49. In every kitchen, family room, dining room, living room, parlor, library, bedroom or similar rooms or area of dwelling units, receptacle outlets shall be installed so that no point along the floor line in any wall space is more than **1,800 mm** measured horizontally from an outlet in that space.
50. The path to ground from circuits equipment and metal enclosures for conductors shall:
- ✓ Have capacity to conduct safely any fault current
 - ✓ Have sufficiently low impedance
 - ✓ Be permanent and continuous

TEST 18: Page 215 – Page 223

1. Where installed in raceways conductors of size **8.0 mm²** and larger shall be stranded.
2. A **Type THHN** conductor has a trade name “moisture resistant thermoplastic”.
3. When the voltage between conductors does NOT exceed 300 V and the roof has a slope of NOT less than 100 mm in 300 mm, the clearance can be reduced to **1,000 mm**.
4. The down conductors shall be protected for a minimum distance of **1,800 mm** above grade level.
5. Fuses shall be plainly marked with: **ampere rating, voltage rating, and interrupting rating**.
6. Which of the following statements is NOT true about grounding electrode conductor?
 - ✓ It shall be solid or stranded
 - ✓ It must be continuous
 - ✓ **Splice or joints are allowed**
 - ✓ It shall be insulated, covered or bare
7. The uses of non-metallic extensions are NOT allowed in all but one of the following. Which one is this?
 - ✓ As an aerial cable
 - ✓ Where exposed to corrosive vapors
 - ✓ **Where subject to corrosive vapors**
 - ✓ Through floors or partitions
8. Fixture wires shall NOT be used **as branch circuit conductors**.

9. Exposed energized parts of motors and controllers shall be guarded against accidental contact by elevating it **2,400 mm** or more above the floor.
10. Exposed energized parts of motor and controller operating at **50 V** or more between terminals shall be guarded against accidental contact by enclosure.
11. To improve the insulation resistance of a motor, it is first cleaned, washed, varnished then baked. Which is very economical and effective method of baking particularly the inside coils of a large motor?
 - ✓ Putting incandescent lamps around the winding and cover
 - ✓ Hanging resistor strips inside the core and cover
 - ✓ **Putting it inside the baking oven and control the oven temperature**
 - ✓ Connecting the terminals to variable low voltage supply and increase the baking current gradually until the desired baking temperature is attained, making sure that the rated current is not exceed.
12. **Controller** includes any switch or device normally used to start and stop a motor by making and breaking the motor circuit current.
13. Grounding electrodes shall be installed such that at least **2,400 mm** of length is in contact with the soil.
14. Lamps installed in scene docks shall be so located and guarded and shall provide an air space of NOT less than **50 mm** between such lamps and any combustible material.
15. Direct burial cables or conductors with a nominal voltage of 660 V or less and placed under a one or two family dwelling driveways and parking areas shall have a minimum cover distance of **460 mm**.
16. A **Type RH** conductor has a trade name "heat-resistant rubber".
17. **Bonding** is the permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.
18. A metal ungrounded gas piping system **shall not be** used as a grounding system.
19. Cartridge fused and fuse holders shall have a maximum operating voltage of **300 V**.
20. The Building Code (PD 1096) of the Philippines has several referral codes. The only no-referral code is
 - ✓ The Philippine Electrical Code
 - ✓ Fire Code
 - ✓ Structural Code
 - ✓ **Chemical Engineering Code**
21. **Type MTW** conductors are used for machine tool wiring in dry or wet locations.
22. Fuses, circuit breakers or combinations thereof shall NOT be connected in **parallel**.
23. At least **150 mm** of free conductor shall be left at each outlet, junction and switch point for splices or the connection of fixtures or devices.
24. Which of the following cables is NOT used as an electrical cable?
 - ✓ Flat cables
 - ✓ Optical fiber cables
 - ✓ Armored cables
 - ✓ **Steel cables**
25. Electrodes of pipe or conduit shall NOT be smaller than **20 mm** trade size.

26. 8.0 mm² TW copper has an ampacity equal to **40 A**.
27. The derating factors for the number of wires in a raceway shall not apply to conductors in nipples having a length NOT exceeding **600 mm**.
28. **Transformer vault** is an enclosure either above or below ground, with fire resistant walls, ceiling and floor exclusively built for unattended transformer and their auxiliaries.
29. A certain residential house lighting load of 1.1 kVA and an appliance load of 10 A at 220 V, single phase, two wires, 60 Hz. The branch circuit fuse protections for lighting and appliance loads are **15 A & 20 A** respectively.
30. One of the approved grounding electrode system is using the metal underground water pipe in direct contact with the earth for **3,000 mm** or more.
31. **Flash point** is the minimum temperature at which a given liquid gives off vapor in sufficient concentration to form an ignitable mixture.
32. One equipment shall in sight from another equipment NOT more than **15 m** from the other.
33. Lamp holders installed over highly combustible material shall be located at least **2,400 mm** above the floor.
34. How can the polarization index of transformer oil be improved? **Ans. Filtering**
35. Ground terminals shall be: **solid plate, stranded cable, and solid wire or rod**.
36. Which of the following statements is NOT true regarding a rosette?
 - ✓ Fusible rosette shall NOT be installed
 - ✓ Rosettes installed in damp or wet locations shall be or weatherproof type
 - ✓ Separable rosettes that may change polarity shall NOT be used
 - ✓ **None of these**
37. Sheet metal of flush and recessed fixture housings shall be protected against corrosion and shall NOT be less than **0.65 mm** thick.
38. What is the size in square millimeters (mm²) of the cable 250 MCM in size? **Ans. 125 mm²**
39. Metal fixtures, transformers and transformer enclosures on circuits operating at over **150 V** to ground shall be grounded.
40. NOT less than **150 mm** of free non-heating lead shall be within the junction box.
41. A circle with the letter B stands for **outlet with blank cover**.
42. The ampacity of branch circuit conductors and the rating or setting of over-current devices supplying fixed electric space heating equipment for pipelines and vessels shall be NOT less than **125%** of the total load of the heaters.
43. Motors with a marked temperature rise NOT over 40°C shall have an overload protection equal to **115%** of the motor full load current.
44. For single-phase AC or DC motors supplied by a 3-wire, single-phase AC or DC with grounded neutral, the number of overload units required shall be **one, in either ungrounded conductor**.
45. For wound rotors, to determine the maximum setting of its short circuit protective device, using a fuse or an inverse time circuit breaker, a multiplying factor of **150%** of its current rating shall be used.
46. The construction of metal cabinets and cutout boxes shall be such as to secure strength and rigidity. If constructed of uncoated sheet steel, the metal thickness should NOT be less than **1.35 mm**.
47. The floors of transformer vaults in contact with the earth shall be of concrete NOT less than **100 mm** thick.

48. The nominal battery voltage shall be computed on the basis of **2.0 V** per cell for the lead acid type.
49. **Class I, Division 2** – Hazardous locations, in which volatile flammable gases are handled, processed or used.
50. In mobile homes, if a range, clothes dryer or similar appliance is connected by metal covered cable or flexible metal conduit, a length of NOT less than **900 mm** of free cable or conduit shall be provided to permit moving the appliance.

TEST 20: Page 232 – Page 240

1. Conductors passing from windows, doors, porches, fire escapes or similar locations shall maintain a horizontal clearance of **1,000 mm**.
2. **Span** is the horizontal distance between two adjacent supporting points of a conductor.
3. **60°C** is the temperature rating of a TW insulated conductor.
4. **Service conductors** are the supply conductors that extend from the street main or from transformer to the service equipment of the premises supplied.
5. Concealed knob and tube wiring shall be supported at intervals NOT exceeding **1,300 mm**.
6. A dead end of a busway shall be **closed**.
7. What is the diameter of a solid wire, which is equivalent to 5.5 mm²? **Ans. d = 2.65 mm**

$$A = \frac{\pi d^2}{4} \text{ thus, } d = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4(5.5)}{\pi}} = 2.65 \text{ mm}$$

8. **Type MI** is a factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper or alloy steel sheath.
9. The combined cross-sectional area of all conductors or cables shall NOT exceed **40%** of the internal cross-sectional area of the raceway.
10. No conductors larger than **50 mm²** shall be installed in cellular metal floor raceways.

11. In mobile homes, receptacle outlets shall NOT be installed within **760 mm** of shower or bathtub space.
12. Rigid non-metallic conduit shall be supported within **900 mm** of each box, cabinet or other conduit termination.
13. Every recreational vehicle site with electrical supply shall be equipped with at least one **20 A, 250 V** receptacle.
14. A main disconnecting means shall be provided where fuses are used or where more than **2 circuit breakers** are employed.
15. For (3) recreational vehicle sites, the demand factor for feeder and service entrance conductors shall be **100%**.
16. Conductors in open wiring on insulators shall be rigidly supported within **300 mm** of a dead end connection to a rosette, lamp holder or receptacle.
17. Electrical metallic tubing smaller than **15 mm** electrical trade size shall NOT be used.
18. **1,300 mm** is the maximum distance between open service conductor supports for a voltage of up to 300 V.
19. Concealed knob and tube wiring shall be permitted to be used
 - ✓ For extensions of existing installations
 - ✓ In unfinished attic and roof spaces
 - ✓ In the hollow spaces of walls and ceilings
20. Type AC cable shall be secured by approved staples, straps hangers or similar fittings at interval NOT exceeding **1,300 mm**.
21. Where coaxial cable is attached to building, they should have a separation of at least **100 mm** from electric light or power cables.
22. Type MC cable shall be permitted for systems in excess of **600 V**.
23. For smooth sheath cables (type MC) with an external diameter of more than 38 mm, shall have a bending radius of NOT less than **15 times** the metallic sheath of the cable.
24. Cables that are flame retardant and have limited smoke characteristics shall be permitted to be identified with the suffix **LS**.
25. Flat cable assembly shall be installed for **exposed work only**.
26. **10 ft** is the minimum clearance of service drops over sidewalks.
27. The overall covering of type NM (non-metallic sheathed) cable shall be **flame retardant and moisture resistant**.
28. **Cleat** is an assembly of two pieces of insulating material provided with grooves for holding one or more conductors at a definite spacing from the surface wired over and from each other, and with holes for fastening in position.
29. Type TC (power and control tray) cable shall be permitted to be used in any of the following EXCEPT one. Which one is this?
 - ✓ In raceway
 - ✓ In cable trays in hazardous (classified) locations
 - ✓ For power, lighting, control, signal and communication circuits
 - ✓ **Where exposed to direct rays of the sun**
30. A phase converter is usually employed to convert single-phase to three-phase power supply so that three-phase motors maybe used. For this service, the PEC specifies that the single-phase conductors shall have an ampacity of NOT less than **216%** of the full load

current rating of motor or load being served where the input and the output voltages are identical.

31. The smallest electrical trade size for rigid non-metallic conduit is **20 mm**.
32. Where flexible metal conduit is installed as a fixed raceway, it shall be secured within **300 mm** on each side of every outlet box.
33. The signatures that are needed in the application form for an electrical permit:
 - ✓ Owner or authorized representative
 - ✓ PEE who signed and sealed the electrical plan
 - ✓ Electrical practitioner in-charge of the installation
34. In the installation of power resistors, a thermal barrier shall be required if the space between the resistors and any combustible material is less than **300 mm**.
35. Splices and taps shall be made only in **junction boxes**.
36. The size of conductors in cablebus system shall be in no case smaller than **50 mm²**.
37. Electrical non-metallic tubing shall be firmly fastened within **900 mm** of each outlet box, junction box, cabinet or fittings.
38. In estimating the loading of a branch circuit, the loading shall be used for each receptacle is **180 VA**.
39. Nails where used as a fastening means, shall be permitted to pass through the interior of the enclosure if located within **6.4 mm** of the back or ends of the enclosure.
40. The conductors including splices and taps shall NOT fill the auxiliary gutter to more than **75%** of its area.
41. A space of **1,000 mm** or more shall be provided between the top of any switchboard and any combustible ceiling.
42. **500,000 ohms** is the minimum insulation resistance of a building's electrical wiring for circuits using 2.0 mm² or 3.5 mm² conductors.
43. NOT more than **48** over-current devices of a lighting and appliance branch circuit panelboard shall be installed in any cabinet or cutout box.
44. For non-insulated busbars, the minimum spacing between it and the bottom of the enclosure shall be **255 mm**.
45. **Knife** is a form of air switch in which the moving element is a hinged blade wedge between stationary contact blades when closed.
46. Open conductors passing over residential driveways and those commercial areas NOT subject to truck traffic where the voltage is limited to 300 V to ground shall maintain a vertical distance of **3,700 mm**.
47. In wiring using rigid metal conduits, conduit smaller than **15 mm** shall NOT be used.
48. **Intermittent duty** is the operation for alternate intervals.
49. Festoon lighting is a string of outdoor lights suspended between two points more than **4,500 mm** apart.
50. From signs, chimneys, radio and television antennas or similar, clearances through vertical, diagonal and horizontal shall NOT be less than **1,000 mm**.

TEST 22: Page 249 – Page 257

1. **Receptacle** is the contact device installed at the outlet for the connection of a single attachment plug.
2. With respect to the safety value of the insulation on electrical maintenance tools, it can be said properly that **the insulation should NOT be used as the only protective measure**.
3. For ranges of 8.75 kW or more in rating, the minimum branch circuit rating shall be **40 A**.
4. Service heads and goosenecks in service entrance cable shall be **above** the point of attachment of the service drops to the building.
5. **Flashover** is a disruptive discharge around or over the surface of a solid or liquid insulator.
6. The minimum size of service lateral conductors using copper wires shall be **5.5 mm²**.
7. Plug fuses shall NOT be installed in circuits exceeding **250 V** between conductors.
8. A continuous electrical load is one where the maximum current is expected to continue for a minimum duration of time. What is this minimum duration of time? **Ans. 3 hours**

9. Direct buried conductors and cables emerging from the ground shall be protected by enclosures or raceways extending from the minimum cover distance required to a point **2,400 mm** above finished grade.
10. For installations to supply only limited loads of a single branch circuit, service entrance conductors shall NOT be smaller than **3.5 mm²** hard drawn copper.
11. **Air terminal** is the upper most portion of a lightning protection system.
12. Where no standard electrical equipment of the exact size or rating required is available, **the next larger standard size** maybe used.
13. **8.0 mm²** is the minimum size of service drop copper conductors allowed by the PEC.
14. Entrances to rooms and other guarded locations containing exposed energized parts shall be marked with a **warning sign**.
15. Appliance outlets installed in a dwelling unit for specific appliances, such as laundry equipment, shall be installed within **1,800 mm** of the intended location of the appliance.
16. **16 A** is the maximum permitted load of a 20-A branch circuit.
Permitted load = 80% of the branch circuit rating = (0.80)(20) = 16 A
17. For warehouses or storage, a general lighting load of **2 VA/m²** shall be used.
18. Outlets for heavy-duty lamp holders shall be rated **600 VA**.
19. When fastening an outlet to a brick wall, the electrician should use **expansion bolts**.
20. **Ground terminal** is a portion of a lightning protection system extending into the earth.
21. Open conductors passing over public streets, alleys, roads, parking areas subject to truck traffic shall maintain a vertical height **5,500 mm** from finished grade.
22. Using copper, the minimum size of service entrance conductors shall be **8.0 mm²**.
23. When testing the insulation integrity of a new or old electrical wiring installation circuit 5.5 mm² conductors, the Code specifies a minimum insulation resistance of **250,000 ohms**.
24. **Insulation resistance test** is usually made on cables after installation.
25. For four to six conductors in a conduit, the derating factor for the conductor ampacity is **80%**.
26. When soldering two copper surfaces together, they should be kept clean while heating by **the use of flux**.
27. Circuits with a voltage of 600 V or less in a rigid metal conduit or in a rigid metal conduit or in a rigid non-metallic conduit approved for direct for direct burial and placed under driveways and parking areas of a one or two family dwelling units, shall have a minimum cover distance of **460 mm**.
28. Plate electrodes of non-ferrous metal shall be at least **1.5 mm** in thickness.
29. Conductors are selected at NOT less than **125%** of the nameplate rating of the water heater.
30. The PEC requires that no electrical installation, alteration or addition shall be connected or reconnected to any electrical power supply without **a certificate of inspection**.
31. Neutral current up to **200 A** is computed at 100%.
32. In general, layout of motors and power outlets NOT exceeding a total of **10** maybe included in the lighting layout provided such inclusion will not make the reading, interpretation and or checking of the said plan difficult.
33. Direct grade level access is defined as being located NOT more than **2,000 mm** above grade level and being readily accessible.

34. For armories and auditoriums, the general lighting load shall be **8 VA/m²**.
35. Before an ammeter is disconnected from an energized current transformer circuit, **Primary winding should be opened**.
36. Power conductors on poles, below communication conductors shall maintain a spacing distance of **760 mm**.
37. It is the intent of the PEC that factory-installed internal wiring or the construction of equipment need NOT be inspected at the time of installation of the equipment EXCEPT
 - ✓ To test for continuity
 - ✓ To test for durability
 - ✓ **To detect alterations or damages**
 - ✓ All of these
38. The standard conductor sizes shall be expressed in **square millimeters**.
39. Mandatory rules of the PEC are characterized by the use of the word "**shall**".
40. **4,600 mm** is the minimum vertical clearance from finished grade of a service drop conductor installed between buildings on residential properties and driveways.
41. Where a neutral is NOT available, the grounding impedance shall be installed between the **grounding electrode and the neutral derived from a grounding transformer**.
42. The voltage developed between the portable or mobile equipment frame and ground by the flow of maximum ground fault current shall NOT exceed **100 V**.
43. A single electrode consisting of a rod, pipe or plate shall have a resistance to ground of **25 ohms** or less.
44. Where more than one electrode is used, each electrode of one grounding system shall NOT be less than **1,900 mm** from any other electrodes of another grounding system.
45. **Board of Electrical Engineering** shall make the final decision in the interpretation of controversial provisions of the PEC.
46. For equipment protected by a 20-A over-current device, the minimum size of equipment grounding conductor using copper shall be **3.5 mm²**.
47. The height of air terminals shall be such as to bring the tip NOT less than **254 mm** above the object to be protected for 6,000 mm maximum intervals.
48. The minimum clearance between the overhead ground wires and the highest protection on the protected structure shall be **1,800 mm**.
49. S₂ means **duplex switch**.
50. **Type RH** conductor is applicable only on dry locations.

Note: To be applicable for wet locations, a letter W shall be included in the type letter of the conductor. Without W, the conductor is applicable only in dry locations.

TEST 24: Page 266 – Page 274

1. Enclosures for over-current devices shall be mounted in **vertical** position.
2. **1,900 mm** is the minimum depth of clear working space in front of a switchboard rated at 4,160 V, where there are exposed energized parts on both sides of the workspace.
3. A 2 mm² TW copper conductor has an ampacity equal to **15 A**.
4. Circuits with a voltage of 600 V or less in a rigid non-metallic conduit approved for direct burial without concrete encasement and placed in trench below a 50 mm thick concrete or equivalent shall have a minimum cover distance of **300 mm**.
5. **Duct** is a single enclosed raceway for conductors or cables.
6. Which of the following statements is NOT correct?
 - ✓ **The use of an inductive ballast for fluorescent lamps is usually because it is the most efficient**

- ✓ Lighting fixtures having exposed ballasts shall be so installed that they will NOT be in contact with combustible materials
 - ✓ A ballast which incorporates an autotransformer to raise the voltage to more than 300 V shall be supplied only by a supply system which is grounded
 - ✓ A receptacle outlet installed outdoors shall be located so that water accumulation is NOT likely to touch the outlet cover or plate
7. Conductor crossings of more than **2 type** FCC cable runs shall NOT be permitted.
 8. A generator set used for standby power systems shall have a time delay feature permitting a **15 minute** setting to avoid retransfer in case of short time reestablishment of the normal source.
 9. Rigid metal conduit shall be firmly fastened within **900 mm** of each outlet box.
 10. Type TW conductors have a maximum operating temperature of **60°C**.
 11. Type UF cable shall be permitted for use **underground including direct burial to earth**.
 12. Enclosures of metal for electrodes of electric discharge tubings shall NOT be less than **0.50 mm** thick sheet metal.
 13. A general-purpose single-phase motor rated 0.5 hp has a current rating of 5 A. what should be the setting of the overload relay that is installed to protect the motor? Assume the service factor of the motor to be 1.0. **Ans. 5.75 A**
Setting = 115% of FLA if motor SF is 1.0 = $1.15 \times 5 = 5.75$ A
 14. The grounded conductor of type FC (flat conductor) cable shall be identified by means of a distinctive and durable white or **natural gray** marking.
 15. For multiple motors on a single crane or hoist, the minimum circuit ampacity of the power conductors shall be the nameplate full load ampere rating of the largest motor for any single crane motion, plus **50%** of the nameplate full load ampere rating of the next largest motor.
 16. Individually covered or insulated grounding conductors shall have a continuous outer finish that is either green, or green with one or more **yellow** stripes.
 17. Intermediate metal conduit shall be shipped in standard lengths of **3,000 mm**.
 18. The smallest copper conductor of type MC cable shall be **0.75 mm²**.
 19. If a bare live conductor is touched accidentally, the severity of the electrical shock is determined primarily by **the contact resistance between the bare wire and the person at the point of contact**.
 20. **15 mm** is the smallest electrical trade size for flexible metal conduit.
 21. **Inverse time**, as applied to circuit breaker, a term indicating there is purposely introduced a delay in the tripping action of the CB.
 22. **Type IGS** is a factory assembly of one or more conductors each individually insulated and enclosed in a loose fit non-metallic flexible conduit as an integrated gas spacer.
 23. Hazardous locations are classified by the PEC in **three classes**.
 24. The branch circuit conductors supplying one or more units of a data processing system shall have an ampacity NOT less than **125%** of the total connected load.
 25. The main disconnecting means for all electric driven irrigation machines shall be visible and NOT more than **15 m** from the machine.
 26. **Non-metallic sheathed cable** is a factory assembly of two or more insulated conductors having an outer sheath of moisture resistant flame-retardant, non-metallic material.

27. The bottom of sign and outline lighting enclosures shall NOT be less than **4,900 mm** above areas accessible to vehicles.
28. Which is the most important thing to do when a person has been shocked by electricity?
- ✓ **Separate the victim from the electric wire as soon as possible making sure that you do not become another victim**
 - ✓ Call for competent help
 - ✓ Apply resuscitation
 - ✓ Disconnect switch
29. **Fastener**, as applied to lightning protection, is an attachment to secure the conductor to the structure or building.
30. In a watercraft, when the source of electric power is a generator, it shall be automatically started and connected to the emergency switchboard within **45 seconds** of loss of main source of electrical power.
31. Generator neutral maybe connected in common, provided that the third harmonic content of the waveform of each generator does NOT exceed **5%**.
32. As a general rule, equipment rated 1,000 A or more and measuring more than 1,900 mm wide, containing over-current devices, shall have an entrance at both ends of the switchboard room. The width and height of each entrance shall be NOT less than **600 mm wide x 2,000 mm high**.
33. Type AC cable shall be secured by approved staples, straps hangers or similar fittings within **300 mm** from every outlet box, junction box, cabinet or fitting.
34. **100 mm** is the maximum electrical trade size of liquidtight flexible metal conduit.
35. Communication conductors shall be separated at least **50 mm** from conductors of any electric light or power circuits.
36. Receptacles used in circuits operating at less than 50 V shall have an ampere rating of NOT less than **15 A**.
37. Each resistance welder shall have an over-current device rated or set at NOT more than **300%** of the conductor rating.
38. To support conduit on a hollow block wall, use **toggle bolt** method.
39. Circuits containing electric discharge lighting transformers exclusively shall NOT be rated in excess of **30 A**.
40. The transformer's secondary open circuit voltage used in electric signs shall NOT exceed **15 kV**.
41. Conductors external to motors and controls in cranes and hoists shall NOT be smaller than **1.25 mm²**.
42. For three cranes supplied by a common conductor system, a demand factor of **91%** shall be used.
43. Intermediate metal conduit shall be supported at least every **3,000 mm**.
44. An over-current device rated or set at NOT more than **200%** of the conductor rating shall protect conductors that supply one or more motor-generator arc welders.
45. Type MI cables shall permitted for: **branch circuits, feeder circuits, and services**
46. Conductors in open wiring on insulators shall be rigidly supported at intervals NOT exceeding **1,300 mm**.

47. **Dumbwaiter** is a hoisting and lowering mechanism equipped with a car which moves in guides in a substantially vertical direction, the floor area of which does NOT exceed 0.85 m² and which is used exclusively for carrying materials.
48. Which of the motor starters does NOT stress the motor winding severely?
- ✓ Across the line starter
 - ✓ **Wye-delta starter**
 - ✓ Soft-start starter
 - ✓ Transformer-type starter
49. The demand factor for two elevators on a single feeder shall be **95%**.
50. Concealed knob and tube wiring shall NOT be used in: **theaters, motion pictures studios, and commercial garage**

TEST 26: Page 283 – Page 291

1. In banks and office buildings, a unit load of **8 VA/m²** shall be included for the general purpose receptacle outlets when the actual number of outlets is unknown.
2. Type AC cable shall be permitted
 - ✓ For branch circuits
 - ✓ For feeders

- ✓ In cable trays where identified for such usage
3. Interlocked type armored cable or corrugated sheath cables shall have a bending radius of NOT less than **7 times** the external diameter of the metallic sheath.
 4. The use of rigid metal conduits shall be permitted under all atmospheric conditions subject to the following conditions EXCEPT one. Which one is this?
 - ✓ Aluminum fittings and enclosures shall be permitted to be used with rigid steel conduits.
 - ✓ Ferrous metal conduits shall be permitted to be installed in concrete.
 - ✓ **Conduits shall be permitted to be used in sand fill which is subject to permanent moisture.**
 - ✓ Where the ferrous raceways are protected solely by enamel, the use is permitted only indoors.
 5. The radius of the inner edge of any bend for type MI cables shall NOT be less than **5 times** the diameter of the cable.
 6. The rating of the branch circuit using flat cable assemblies shall NOT exceed **30 A**.
 7. Where receptacles are connected to a 30-A branch circuit, the maximum allowable cord and plug connected load shall NOT be more than **24 A**.

Note: Load permitted shall NOT exceed 80% of the branch circuit rating
 8. At least **(1)** receptacle outlet shall be installed in the bathroom.
 9. Rigid metal conduit shall be supported at least every **3,000 mm**.
 10. **5%** is the maximum allowable voltage drop from the distribution panel to the farthest load.
 11. **Open wiring on insulators** is an exposed wiring method using cleats, knobs, tubes and flexible tubing for the protection and support of single insulated conductor run in or on building and not concealed by the building structure.
 12. Conductors in concealed knob and tube wiring shall maintain a clearance of NOT less than **26 mm** between the conductor and the surface over which it passes.
 13. General purpose and appliance branch circuits using type FCC cable shall have ratings NOT exceeding **20 A**.
 14. **Cable tray** is a unit assembly of units or sections and associated fittings, forming a rigid structural system used to support cables.
 15. Over-current in transformers affect all of the following EXCEPT
 - ✓ **Breather effectiveness**
 - ✓ Mechanical stresses
 - ✓ Life insulation
 - ✓ Rise in temperature
 16. The rating of the branch circuit serving a continuous load shall NOT exceed **125%** of the continuous load.
 17. One or more non-metallic surface extensions shall be permitted to be run in any direction from an existing outlet, but NOT on the floor or within **50 mm** from the floor.
 18. Where a conduit enters a box, fitting or other enclosure, a **bushing** shall be provided to protect the wire from abrasions.
 19. Bonding jumpers which connect communications cable grounding conductors and the grounding electrode of the building shall NOT be smaller than **14 mm²** copper size.

20. In hospitals, the general lighting load required shall be **16 VA/m²**.
21. Each plate electrode shall expose NOT less than **one-fifth square meter** of surface to exterior soil.
22. Non-metallic sheathed cable shall NOT have a bending radius less than **5 times** the diameter of the cable.
23. **Branch circuit conductors** are conductors after the final over-current and before the load served.
24. In every drawing, the title block shall be a standard strip, which shall contain the name of the project, owner, title of the sheet, scale used, name and signature of the PEE. How wide is the strip? **Ans. 40 mm**
25. **Periodic duty** is an intermittent operation in which the load condition is regularly recurrent.
26. **Type TC** is a factory assembly of two or more insulated conductors with or without associated bare or covered grounding conductor under a non-metallic sheath, approved for installation in cable trays or in raceways.
27. Rod electrodes of steel or iron shall be at least **16 mm** in diameter.
28. The minimum size of conductors to be used for lighting purposes is **2 mm²**.
29. Conductors on poles shall have a separation of NOT less than **300 mm** where not placed on racks or brackets.
30. Type FCC cable shall be permitted for the following applications EXCEPT one. Which one is this?
- ✓ For branch circuits
 - ✓ **For service entrance**
 - ✓ In damp locations
 - ✓ In heated floors
31. Non-metallic surface extensions shall be secured in place by approved means at interval NOT exceeding **200 mm**.
32. Any unguarded metal sheathed service cable, service conduits, metal fixtures and similar non-current carrying parts, if located in urban districts and where liable to be charged to more than **300 V** to ground shall be isolated or guarded so as not to be exposed to accidental contact by unauthorized persons.
33. Auxiliary gutters may enclose conductors or busbars but shall NOT enclose
- ✓ Switches
 - ✓ Over-current devices
 - ✓ Appliances
34. **RA 7920** – Republic Act which is known as the “New Electrical Engineering Law”.
35. Where an intermediate metal conduit is used, there shall NOT be more than the equivalent of **4 quarter bends** between pull points.
36. Underground cable feeder and branch circuit cables shall be permitted for use in any of the following applications EXCEPT one. Which one is this?
- ✓ Where embedded in poured concrete
 - ✓ **For interior wiring**
 - ✓ For direct burial
 - ✓ Where used in corrosive locations

37. Rigid metal conduits smaller than **15 mm** electrical trade size shall NOT be used.
38. Flexible metal conduit shall be secured by an approved means at intervals NOT exceeding **1,300 mm**.
39. Which of the following premises wiring installations is NOT covered in the scope of the PEC?
 - ✓ Parking lots
 - ✓ dockyards
 - ✓ quarries and mines
 - ✓ **Motor vehicles**
40. **Pilot wire** is an auxiliary conductor used in connection with remote measuring devices or for operating apparatus at a distant point.
41. Service entrance conductors passing over roofs shall have a clearance over the roof which they pass of **2,500 mm**.
42. The conductors including splices and taps shall NOT fill the wireway to more than **75%** of its area at that point.
43. Liquidtight metal conduit smaller than **15 mm** electrical trade size shall NOT be used.
44. Service drop conductors passing over residential property and driveways and those commercial areas not subject to truck traffic shall have a vertical clearance of **4,600 mm**.
45. The equipment bonding jumper shall be permitted to be installed inside or outside of a raceway or enclosures where installed on the outside, the length of the equipment bonding jumper shall NOT exceed **1,800 mm**.
46. An electrician should consider all electrical equipment live unless he definitely knows that they are not. The main reason of this practice is to avoid **personal injury**.
47. Electrical floor assemblies shall NOT be installed
 - ✓ Where subject to corroded vapors
 - ✓ Outdoors
 - ✓ In wet or damp locations
48. In cases where there are energized parts normally exposed on the front of switchboards or motor control centers, the working space in front shall NOT be less than **1,000 mm**.
49. Cabinet and cutout boxes shall have an air space of at least **2 mm** between the base of the device and the wall of any metal cabinet or cutout box in which the device is mounted.
50. Service conductors in cable shall NOT be smaller than **5.5 mm²**.

TEST 28: Page 300 – Page 308

1. For non-dwelling receptacle loads, the demand factor for the first 10 kVA or less shall be **100%**.
2. In each conduit run entering an enclosure for switches, circuit breakers, relays and others that may produce high temperatures, seals on the conduit shall be installed within **460 mm** length before entering the enclosure.
3. The ampacity of the conductors can be derated at most, **3 times**.
4. In the schedule of loads for lighting, which of the following contents is NOT necessary?
 - ✓ Protective device rating
 - ✓ Panel as numbered in the feeder diagram
 - ✓ Number of lighting outlets per circuit
 - ✓ **Frequency rating**
5. If potential exceeding **600 V** are employed, a permanent warning sign shall be displayed.
6. **Continuous load** is a load where maximum current is expected to continue for 3 hours or more.
7. Communication conductors shall NOT be smaller than **2 mm²**.
8. Receptacle and attachment plugs shall be permitted to be of lower ampere rating than the branch circuit but NOT less than **125%** of the fixture full load current.
9. A wye-delta starter for a single voltage three phase squirrel cage induction motor would require the connection of **6 wires** from the motor.
10. At least **(1)** receptacle outlet shall be installed outdoors for a one family dwelling unit.
11. **12 A** is the maximum permitted load of a 15 A branch circuit.

Note: Load permitted shall NOT exceed 80% of the branch circuit rating
12. Where a feeder supplies continuous load or any combination of continuous and non-continuous load. The rating of the over-current device shall NOT be less than the non-continuous load plus **125%** of the continuous load.
13. Faceplates of insulating material shall be non-combustible and NOT less than **2.3 mm** in thickness.
14. For raceway 20 mm trade size or larger containing conductors 22 mm² or larger, the minimum length of the box in straight pulls shall NOT be less than **8 times** the trade diameter of the largest raceway.
15. Type MC cable shall NOT be used
 - ✓ Where exposed to corrosive materials
 - ✓ As direct burial to earth
 - ✓ Where exposed to cinder fills
16. Using aluminum or copper clad aluminum conductors, the minimum size of service entrance conductors shall be **14 mm²**.
17. Ground counterpoise conductor shall be soft copper wire NOT smaller than **8 mm²**.
18. The disconnecting means for motor circuits rated up to 600 volts, shall have an ampere rating of at least **115%** of the full load current of the motor.
19. How many amperes will a 100 A circuit breaker hold before tripping open the circuit? (use rule of thumb). **Ans. 300 A**

20. **Transfer switch** is a device for transferring one or more load conductor connections from one power source to another.
21. For an AC transformer and DC rectifier arc welder having a time rating of one hour, the supply conductors shall NOT be less than **75%** of its rated primary nameplate current.
22. **Electric locomotive** refers to the power plant mounted on wheels as used in the railroad transportation industry.
23. If the terminal of the equipment grounding conductor is not visible, the conductor entrance hole shall be marked with the word "**green**".
24. Type NMC (non-metallic sheathed cable) shall have an outer covering which has the following characteristics. Which one is NOT included?
 - ✓ Flame retardant
 - ✓ Moisture resistant
 - ✓ Corrosion resistant
 - ✓ **None of these**
25. Power and control tray cables (type TC) maybe used **where installed in industrial establishment where a registered master electrician will service the installation.**
26. Where rear access is required to work on de-energized parts on the back of enclosed equipment, a minimum working space of **800 mm** horizontally shall be provided.
27. A one family dwelling unit shall have a disconnecting means of at least **60 A** where the initial computed load is 10 kVA or more.
28. Large batteries are those connected to a charging device with an output of more than **2 kW**.
29. **Field winding** is a component of a DC motor which is used to control the speed.
30. Switches used in watercrafts, shall be capable of breaking and making safely a load current equal to **150%** of their rated current at the rated voltage.
31. **Concealed knob and tube wiring** is a wiring method using knobs, tubes, and flexible non-metallic tubing for the protection and support of single insulated conductors concealed in hollow spaces of walls and ceilings of buildings.
32. The ampacity of the branch circuit conductors and the rating or setting of over-current protective devices supplying fixed electric space heating equipment consisting of resistance elements with or without a motor shall NOT be less than **125%** of the total load of the motors and the heaters.
33. **Both commutator and slip ring** is a repulsion motor equipped.
34. Communication conductors shall have a vertical clearance of NOT less than **2,400 mm** from all points of roofs above, which they pass.
35. **Corona** is a luminous discharge due to ionization of the air surrounding a conductor caused by a voltage gradient exceeding a certain critical value.
36. **General purpose branch circuit** is a branch circuit that supplies a number of outlets for lighting and appliance.
37. The minimum number of branch circuits shall be determined from the **total computed load and the rating of the circuits used.**
38. The insulated conductor of type TC (cable tray) cable shall be in sizes **0.75 mm²** through **500 mm²** copper.
39. A motor-generator arc welder has a 70% duty cycle, the supply conductors shall NOT be less than **86%** of its rated primary nameplate current.

40. A frequency meter is connected as a potential device, which is connected across the line because of **the reading will be independent of the varying current.**
41. Rigid non-metallic conduit approved for direct burial without concrete encasement shall have a minimum burial of **460 mm.**
42. All metal parts associated with the hot tub shall be bonded using copper bonding jumper, insulated, covered, or bare, NOT smaller than **8 mm².**
43. All lighting fixtures, submersible pumps and other submersible equipment used in fountains shall operate at **250 V** or less between conductors.
44. The ground counterpoise when installed in earth shall be placed **75 mm** above all cable in a trench.
45. Type FCC cable shall NOT be used in any of the following EXCEPT
 - ✓ outdoors
 - ✓ **Indoors**
 - ✓ Wet locations
 - ✓ Hazardous locations
46. The ampacity of the conductors and the rating or setting of over-current devices in a circuit of a solar photovoltaic system shall NOT be less than **125%** of the computed current.
47. For signaling circuits NOT exceeding **24 V**, the current required shall NOT exceed 1 A.
48. The grounding electrode shall be
 - ✓ The nearest available effectively grounded structural metal member of the structure.
 - ✓ The nearest available effectively grounded metal water pipe
 - ✓ The nearest concrete encased electrode
49. Non-metallic boxes NOT over **1,640 cm³** shall be permitted only on non-metallic wiring method.
50. The equipment bonding jumper (the connection between the equipment grounding conductor and the grounding impedance) shall be **an unspliced conductor run.**

TEST 30: Page 317 – Page 325

1. According to its make, conduits may be classified as
 - ✓ Rigid metal
 - ✓ Rigid non-metal
 - ✓ Flexible metal
2. In no case shall the grounding conductor be smaller than **8 mm²** copper.
3. **Class I** – Hazardous location in which flammable gases or vapors are present in the air in quantities sufficient to produce explosives or ignitable mixtures.
4. The system neutral conductor shall NOT be connected to ground, EXCEPT through the neutral **grounding impedance**.
5. In a damp or wet locations, cabinets and cutout boxes of the surface type shall be mounted with at least **6.4 mm** air space between the enclosure and the wall.
6. The minimum diameter of a solid air terminal under class I material requirements shall be **9.5 mm** for copper and **12.7 mm** for aluminum.
7. Circuits with a nominal voltage of 600 V or less in a rigid metal conduit or intermediate metal conduit and placed in a trench below a 50 mm thick concrete or equivalent shall maintain a minimum cover distance of **150 mm**.
8. Vertical clearances of all service drop conductors above roofs shall NOT be less than **2,500 mm**.
9. The lightning conductor or ground terminal shall extend vertically NOT less than **3,000 mm** into earth.
10. The circuit supplying an autotransformer type dimmer shall NOT exceed **230 V** between conductors.
11. **Sideflash** is a spark occurring between nearby metallic objects or from such objects to the lightning protection system or to ground.
12. Covers for boxes shall be permanently marked. The marking shall be on the outside of the box using the block type letters at least **12 mm** in height.
13. When wiring a raceway at least **150 mm** of free conductors shall be left at each outlet.
14. Where a rigid metal conduit is used, there shall NOT be more than the equivalent of **4 quarter bends** between pull points.
15. There shall be at least **2 down conductors** on a heavy-duty smoke or vent stacks.
16. If the setting of the over-current device in a circuit ahead of the equipment is 60 A, the minimum equipment grounding conductor using copper shall be **5.5 mm²**.
17. **Messenger supported wiring** is an exposed wiring support system using a messenger wire to support insulated conductors.
18. Air terminal shall be within **600 mm** of outermost projection of roof edge.
19. In replacing a busted fuse which of the following is important? **Ans. same size and type**
20. **Coaxial wires** have 75-ohm impedance.
21. Rigid metal conduit shall be shipped in standard lengths of **3,000 mm**.
22. **Cord** is the term given to an insulated stranded wire.

23. Exposed non-current carrying metal parts of fixed equipment likely to become energized shall be grounded under the following conditions. Which one is NOT included?
- ✓ Where located in wet or damp locations
 - ✓ **Where in electrical contact with wooden floor**
 - ✓ Where in a classified hazardous locations
 - ✓ Where supplied with a metal raceway or other wiring methods
24. Electrical equipment except x-ray tube inside anesthetizing room shall be located at least **2,400 mm** above the floor.
25. Where the distance requirement in making holes cannot be maintained, the cable or raceway shall be protected from penetration by screws or nails by a steel plate of bushings at least **1.6 mm** thick and of approved length and width to cover the area of the winding.
26. The entire area of the aircraft hangar, including any adjacent communication areas not suitably cut-off from the hangar shall be classified as hazardous up to a level of **460 mm** above the floor.
27. In which method of starting a motor is the starting current a minimum? **Ans. star-delta**
28. All switches and circuit breakers used as switches shall be so installed that the center of the grip of the operating handle when in its highest position shall NOT be more than **2,000 mm** above the floor or working platform.
29. For straight pulls, the length of the pull box shall NOT be less than **32 times** the outside diameter of the largest non-shielded conductor or cable.
30. Aluminum electrode **shall NOT be** permitted to be used.
31. Electrical non-metallic tubing shall be clearly and durably marked at least every **3,000 mm**.
32. Which of the following sizes of fuse is NOT standard? (80 A, 45 A, 125 A, **75 A**)
33. The PEC, Part 1 does not cover wiring of equipment installed within **airplanes**.
34. **15 mm** is the smallest electrical trade size of intermediate metal conduit.
35. The use of electrical metallic tubing shall be permitted for **exposed works and concealed works**.
36. The zone of protection of an overhead ground wire is conventionally taken as a **triangular prism**.
37. The minimum spacing between bare metal parts of opposite polarity where mounted on the same surface shall be **32 mm** for voltages rated NOT over 250 V nominal.
38. The maximum electrical trade size of flexible metallic tubing shall be **20 mm**.
39. **Arrester** is a protective device for limiting surge voltages by discharging or by passing surge current.
40. A convenience outlet circuit consisting of 8 outlets connected across a 220 V supply considering 180 W per outlet, what is the maximum circuit current? **Ans. 6.54 A**
- $$I = \frac{P}{E} = \frac{180}{220}(8) = 6.54 \text{ A}$$
41. Plug fuses and fuse holders shall NOT be installed or used in circuits exceeding **250 V** between conductors.
42. The standard length of rigid metal conduit is **10 feet**.
43. For warehouses, the feeder demand load for the general lighting and small appliance load for the first 12,500 VA or less is 100%, while the remainder over 12,500 VA is charged at **50%**.

44. Liquidtight flexible non-metallic conduit shall NOT be used in lengths longer than **1,800 mm**.
45. Line and ground connecting conductors to surge arresters shall NOT be smaller than **2 mm²** copper or **3.5 mm²** aluminum.
46. Electrical metallic tubing shall be securely fastened in place at least every **3,000 mm**.
47. For the purpose of lightning protection, class I ordinary building is one that is at less than **23 m** in height.
48. For dwelling units, the demand factor for the first 3,000 VA of load is **100%**.
49. Ventilating pipes for motors, generators or other rotating electric machinery or for enclosures for electric equipment shall be of metal NOT less than **0.50 mm** in thickness.
50. Direct burial cables or conductors with nominal voltage of 600 V or less and passes under streets, hi-ways, roads, alleys, driveways and parking lots shall have a minimum cover distance of **600 mm**.

TEST 32: Page 334 – Page 342

1. **Type FC** is a factory assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in metal surface raceway.
2. Snap switches shall NOT be grouped or ganged in enclosures unless they can be so arranged that the voltage between adjacent switches does NOT exceed **300 V**.
3. Wiring located above heated ceilings shall be NOT less than **50 mm** above the heated ceiling and shall be considered as operating at an ambient of 50°C.
4. **Wireways** are rectangular sheet metal enclosures equipped with removable covers providing access to conductors inside.
5. Each unit length of heating cable shall have a permanent legible marking of each non-heating lead located within **75 mm** of the terminal end.
6. Metal faceplates or receptacles shall be of ferrous metal NOT less than **0.76 mm** in thickness or of non-ferrous metal NOT less than **1 mm** in thickness.
7. Surface mounted incandescent fixtures shall be permitted to be installed in clothes closets provided there is a minimum clearance of **300 mm** between the fixture and the nearest point of the storage area.
8. Thermal insulation shall NOT be installed within **38 mm** of the recessed fixture enclosure.
9. Lighting track load shall NOT be installed where less than **1,500 mm** above the finished floor EXCEPT where protected from physical damage.
10. Where circuit breakers are used to protect the primary side of a transformer over 600 V nominal, their continuous current rating shall NOT exceed **300%** of the rated primary current.
11. The lowest standard size of disconnect is **30 A**.
12. The primary winding of a step down transformer shall be protected on the primary side by an over-current device rated NOT more than **125%** of the primary current.
13. For a two-wire FCC cable system with grounding, the grounding conductor shall be **the middle** conductor.
14. Where passing through wood cross members in plastered partitions, conductors in concealed knob and tube wiring shall be protected by insulating tubes extending NOT less than **76 mm** beyond the wood member.
15. Branch circuit conductors supplying a single motor shall have an ampacity NOT less than **125%** of the motor full load current rating.
16. In indoor wet locations, the entire wiring system including all boxes, fittings, control boards and panelboards shall be installed on walls with **10 mm** minimum clearance.
17. Type NM cable shall NOT be installed...
 - ✓ Where exposed to corrosive material
 - ✓ Where embedded in concrete
 - ✓ In a shallow chase in masonry, concrete or adobe
18. Dry type transformers installed indoors and rated 112.5 kVA or less shall have a separation of at least **300 mm** from combustible material.

19. **Type SNM cable** is a factory assembly of two or more insulated conductors in an extruded core of moisture resistant, flame retardant non-metallic material covered with an overlapping spiral metal tape and wire shield and jacketed with an extruded moisture, flame, oil, corrosion, fungus and sunlight resistant non-metallic material.
20. To cut rigid metal conduits, an electrician should **use a hack saw and ream the ends**.
21. Where the overload relay selected using the factor 125% is not sufficient to start the motor or to carry the load, the multiplying factor shall be increased but shall NOT exceed **140%**.
22. Where the protection of a motor-compressor load is not sufficient for the starting current of the motor, the rating or setting shall be increased but NOT more than **225%** of its rated load current.
23. **Insulating end** is an insulator designed to electrically insulate the end of a type FCC cable.
24. **Flat conductor cable** consists of 3 or more flat copper conductor placed edge to edge separated and enclosed within an insulating assembly.
25. Lamp holders installed in wet or damp locations shall be of the **weatherproof** type.
26. The single-phase conductors supplying the phase converter shall have an ampacity NOT less than **2.16 times** the full load current rating of the motor or load being served.
27. **Non-metallic extension** is an assembly of 2 insulated conductors within a non-metallic jacket or an extruded thermoplastic covering.
28. Dry type transformers rated over **35,000 V**, shall be installed in vaults.
29. In walls or ceilings of concrete, tile, or other non-combustible materials, boxes and fittings shall be installed that the front edge of the box or fitting will NOT set back of the finished surface more than **6.4 mm**.
30. **Type MV cable** is a single or multi-conductor solid dielectric insulated cable rated 2001 volts or higher.
31. In selecting the maximum setting of an instantaneous trip CB to be used to protect all AC motors from short circuit, a multiplying factor of **700%** shall be used.
32. The paper spacer thickness of type IGS cable having a conductor size of 125 mm² to 500 mm² shall be **1.02 mm**.
33. **48 devices** is the minimum number of over-current device of a lighting and appliance panel board that shall be installed in a cabinet.
34. Intermediate metal conduit shall be firmly fastened within **900 mm** of each outlet box, junction box, cabinet or fitting.
35. Resistance type heating elements in electric space heating equipment shall be protected at NOT more than **60 A**.
36. Heavy-duty lighting track is a lighting track identified for use exceeding **20 A**.
37. For three-phase motors supplied by any 3-phase system, the number of overload units required shall be **3, one in each phase**.
38. As compared with solid wires, stranded wires of the same cross sectional area have the following advantage EXCEPT one. Which one is this?
 - ✓ It is larger in overall diameter
 - ✓ **It is easier to skin off the insulation**
 - ✓ It is better for high voltage
 - ✓ It has a higher current rating

39. Each length of the rigid metal conduit shall be clearly and durably identified in every **3,000 mm** as required.
40. For all single-phase motors, to protect them from short circuits and ground faults, a multiplying factor of **300%** of its full load current rating shall be used the protective device selected is a non-time delay fuse and **175%** if the protective device is a time delay fuse.
41. Flexible metal conduit shall be supported within **300 mm** on each side of every outlet box, junction box, cabinet or fitting.
42. The maximum electrical trade size of electrical metallic tubing shall be **100 mm**.
43. For installations of 2 mm² conductors in 600 V circuits. What is the minimum insulation resistance allowed by the PEC? **Ans. 500,000 ohms**
44. Askarel insulated transformers installed indoors and rated over **25 kVA** shall be furnished with a pressure relief vent.
45. In straight pulls, the length of the pull box shall NOT be less than **8 times** the trade diameter of the largest raceway.
46. Busways shall be securely supported at intervals NOT exceeding **1,500 mm** unless otherwise designed and marked.
47. The smallest electrical trade size of a liquidtight flexible non-metallic conduit shall be **20 mm**.
48. Boxes intended to enclose flush devices shall have an internal depth of NOT less than **24 mm**.
49. A branch circuit supplying a fixed storage type water heater having a capacity of 450 liters or less shall have a rating NOT less than **125%** of the nameplate rating of the water heater.
50. **Cover** is define as the shortest distance measured between a point on the top surface of any direct buried conductor, cable, conduit and the top surface of finish grade.

TEST 34: Page 351 – Page 359

1. A wall screen or fence less than **2,500 mm** in height shall NOT be considered as a preventing access unless it has other features that provide a degree of isolation equivalent to the height of the fence in question.
2. Branch circuit conductors supplying a single-phase motor shall have an ampacity NOT exceeding **125%**.
3. Pits within **7,600 mm** horizontally from the flammable vapor source, shall be considered a hazardous location under Class I, Division 1 location.
4. Type TW conductor is a **moisture resistant and thermoplastic** type.
5. **Ampacity** is the current in amperes a conductor can carry continuously under the conditions of use without exceeding its temperature rating.
6. Flat conductor cables maybe installed in any of the following location EXCEPT one. Which one is this?
 - ✓ On hard concrete flooring
 - ✓ **In wet locations**
 - ✓ For branch circuits
 - ✓ In damp locations
7. **Varying duty** is an operation of loads and for intervals of time, both of which may be subject to wide variations.
8. For equipment rated 1,200 A and over, 1,900 mm wide containing over-current devices and control devices at least one entrance of NOT less than **600 mm** wide and **2,000 mm** high shall be provided at each end.
9. Batteries and direct current circuits shall be physically separated by at least a **12 mm** gap or other approved means from circuits of a different power source.
10. Where contactors are used as the disconnecting means for fuses, an individually externally operable switch, such as tumbler switch for the control of each contactor shall be located at a distance of NOT more than **1,800 mm** from the contactor.
11. No electrical installation, alteration and or addition shall be connected or reconnected to any power supply or any other sources of electrical energy without **certificate of final inspection**.
12. (4) 3-phase motor are supplied by one common feeder cable. The full load current ratings of the motors are 10 A, 20 A, 30 A and 40 A. What should be the minimum ampacity of the feeder cable? **Ans. 110 A**
Feeder ampacity = Sum of FLAs + 25% of largest FLA
Feeder ampacity = 10 + 20 + 30 + 40 + 0.25(40) = 110 A
13. Thermal barrier shall be required if the space between the resistors and reactors and any combustible material is less than **300 mm**.

14. The ampacity of conductors that connect a capacitor to the terminals of a motor circuit conductor shall NOT be less than **one-third** the ampacity of the motor circuit conductors and in no case less than 135% of the rated capacitor current.
15. The load for each ungrounded feeder and service conductor supplying 5 to 8 receptacles that supply shore power for boats shall be calculated as **90%** of the sum of the rating of the receptacles.
16. **Interlock** is a device actuated by the operation of some devices with which it is directly associated, to govern succeeding operations of some or allied devices.
17. **Service lateral** is the service conductors between the street main, including any risers at pole or other structure or from transformers and the first point of connection to the service entrance conductors.
18. For 101 A to 200 A circuits, the minimum insulation required shall be **50,000 ohms**.
19. **175 kVA** is NOT a standard kVA rating of a single-phase transformer.
20. For voltages above 600 V, the minimum insulation resistance shall be **1,000,000 ohms per kilovolt rating**.
21. The rating of any cord and plug connected utilization equipment shall NOT exceed **80%** of the branch circuit rating.
22. If there will be six or more 2-wire branch circuits, the service disconnecting means shall NOT be smaller than **100 A**.
23. For direct current motors, the multiplying factor to be used in selecting the size of over-current device using an inverse time CB shall be **150%** of its full load current.
24. Specifications written on the plans or submitted on separate standard size sheets shall show...
 - ✓ Types of wiring, i.e. service entrance, branch circuits, feeders, etc
 - ✓ Nature of electrical service, i.e. no. of phase, voltage, frequency, etc
 - ✓ Special equipment to be installed indicating ratings
25. **Stationary appliance** is an appliance which is fixed in one place to another in normal use.
26. In starting a large DC motor, a starter is primarily used in order to **limit the starting current**.
27. **Class III, Division 2** – Hazardous locations in which easily ignitable fibers are stored and handled.
28. In commercial garages, repair and storage areas, the entire area up to a level of **460 mm** above the floor shall be considered to be Class I, Division 2 hazardous location.
29. Conductors passing over roof surface, a vertical clearance of **2,500 mm** shall be maintained.
30. In this new Electrical Engineering Law, what is the official designation of "master electrician"? **Ans. Registered Master Electrician**
31. **Peak load** is the maximum load consumed or produced by a unit or group of units in a stated period of time.
32. **Isolation transformer** is a transformer of the multiple winding type with the primary and secondary winding physically separated which inductively couples its secondary winding to the grounded feeder system that energizes its primary winding.
33. In judging the suitability of electrical equipment for proper mounting, the following factors should be considered, one of which is the LEAST important. Which one is this?
 - ✓ Type of enclosure

- ✓ Wire bending space
 - ✓ **Electrical insulation**
 - ✓ Mechanical strength
34. The branches of the emergency system in a hospital shall be installed and connected to the alternate power source so that all functions shall automatically restored to operation within **10 seconds** after interruption of the normal source.
 35. **3,100 mm** is the minimum distance of open conductors of not over 600 V and above finished grade, sidewalks or from any flat form or projection which they might be reached where the supply conductors are limited to 150 V to ground and accessible to pedestrians only.
 36. Which of the following wiring cables is most suitable for shipboard installations?
 - ✓ Flat cable assembly
 - ✓ Shielded non-metallic sheathed cable
 - ✓ Metal clad cable
 - ✓ **Armored cable**
 37. If there will be four or more appliances fastened in place and served by the same feeder, it shall be permissible to apply a demand factor of **75%** to the total nameplate ratings of the loads.
 38. All exposed incandescent lamps in dressing rooms, where less than **2,400 mm** from the floor, shall be equipped with open end guards riveted to the outlet or otherwise locked in place.
 39. **5%** is the maximum allowable voltage drop from the main circuit breaker to the farthest lamp load.
 40. Where the voltage between conductors does NOT exceed 300 V and the roof has a slope of NOT less than 100 mm in 300 mm, a reduction to **1,000 mm** of the distance of the service conductors from the roof surface shall be permitted.
 41. If there are no over-current protective device rated 30 A or less with neutral connection, this panelboard is classified as a **power panelboard**.
 42. **Individual branch circuit** is a branch circuit that supplies only one utilization equipment.
 43. In halls, corridors, closets and stairways of any occupancy EXCEPT one family dwelling unit, a general lighting load of **4 VA/m²** shall be considered.
 44. At least one receptacle outlet shall be installed directly above a show window for each **three** linear meter length or a major fraction thereof.
 45. **Service point** is the point of connection between the facilities of the serving utility and the premises wiring.
 46. According to the Code the minimum insulation level for neutral conductor of residential installation which has solidly grounded system shall be **300 V**.
 47. A demand factor of **50%** of maximum possible connected load for television studio sets shall be permitted for all portable feeders.
 48. For office buildings, a general lighting load of **28 VA/m²** shall be used.
 49. An insulated conductor intended for use as a grounded conductor where contained within a flexible cord shall be identified by a white or a **natural gray** outlet finish color.
 50. The allowable ampacities of conductors rated from 0 to 2,000 volts, 60°C to 90°C and not more than three of them in raceway, cable or earth is based on an ambient temperature of **30°C**.

TEST 36: Page 368 – Page 376

1. Busways shall be permitted to be installed behind panels if means of access are provided and if the conditions below are met. One of them is NOT valid. Which one is this?
 - ✓ No over-current devices are installed on the busway other than for an individual fixture
 - ✓ The busway is so installed that the joints between sections and fitting are accessible for maintenance purposes
 - ✓ **The busway is open and of the ventilator type**
 - ✓ The space behind the panels is not for air handling purposes
2. The OCPD for resistance welders shall NOT exceed **300%** of the conductor's ampacity supplying the circuit.
3. For installations to supply only limited load of a single branch circuit, the service disconnecting means shall have a rating of NOT less than **15 A**.
4. Metal clad cable (MC) can be used in systems of 600 V or **more**.
5. Open conductors passing over residential driveways and those commercial areas not subject to truck traffic where the voltage exceeds 300 V to ground shall have a vertical clearance of **4,600 mm**.
6. MC cable insulation shall have a maximum operating temperature of NOT less than **90°C**.
7. The ampacity of conductors in non-metallic sheathed cable shall be used at **60°C**.
8. What is the radius of a solid round conductor, which is the nearest equivalent of a stranded conductor whose total area is exactly 8 mm²? **Ans. 3.191 mm**

$$A = \frac{\pi d^2}{4} ; d = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4(8)}{\pi}} = 3.191 \text{ mm}$$

9. For high impedance grounding, the system **neutral** conductor shall NOT be connected to the ground EXCEPT through the grounding impedance.
10. Service equipment rated over 600 V located on mezzanine floors shall be required to be accessible by permanent **stairways & ladders**.
11. The load for household electric clothes dryer in a dwelling unit is the larger of the nameplate rating or **5,000 VA**.
12. Each lighting and appliance branch circuit panelboard shall be protected individually on the supply side by NOT more than two main CBs or two sets of fuses having a combined rating NOT **greater** than that of the panelboard.
13. The long time rating for x-ray equipment is based on an operating time of **5 minutes** or longer.

14. For circuits supplying loads consisting of motor operated utilization equipment that is fastened in place and that has a motor larger than 0.125 hp in combination with other loads, the total computed load shall be based on **125%** of the largest motor load plus the sum of the other loads.
15. Exposed AC cable shall closely follow the **finish** of the building.
16. A 3-phase general purpose squirrel cage motor draws a full load current of 40 A. what is the maximum size of time delay that may be used for short circuit protection? **Ans. 80 A**
 Size = 175% of FLA = 1.75(40) = 70 A
 The closest higher standard rating is an 80 A fuse.
17. A 5.5 mm² TW copper conductor has a conductor ampacity of **30 A**.
18. The branch circuit load for continuous duty receptacles shall be calculated at **180 VA** per receptacle.
19. Ground rod clamps shall be secured with at least **2 bolts** or cap screws.
20. Over-current protection devices in emergency system shall...
 ✓ Be coordinated
 ✓ Clear in steps
 ✓ NOT trip the main device
21. **Service lateral** is the underground service conductors between the street main, including any risers at the pole or other structure or from transformer and the first point of connection to the service entrance conductors in a terminal box. The point of connection is considered to be the point of entrance of the service conductors into the building.
22. Down conductors on a heavy duty smoke or vent stacks shall be protected from physical damage or displacement for a distance of NOT less than **2,400 mm** above finish grade.
23. The PEC permits **(4)** 90° bends in a single conduit run.
24. A warning sign shall be posted where **high voltage** is available in service equipment.
25. Circuits with a nominal voltage of 600 V or less in rigid metal or non-metallic conduit and placed under a minimum of 100 mm thick concrete exterior slab with no vehicular traffic shall have a minimum cover distance of **100 mm**.
26. Conductors supplying a group of motor-generator arc welders are sized at **85%** of the third largest welder plus the percentage of the other welders.
27. Which of the following statements on wiring in commercial garages and shops is NOT correct?
 ✓ The ground conductor shall be connected to the ground terminal of the utilization equipment
 ✓ Receptacles, attachment plugs and similar devices shall be of the polarized type
 ✓ **Lamps and lamp holders for fixed lighting that are located above vehicles shall be installed NOT lower than 2,500 mm**
 ✓ Battery chargers and batteries being charged shall NOT be located in location classified as hazardous
28. Conductors may travel horizontally through **vertical sections** of switchboards if isolated from busbars by a barrier.
29. There shall be no more than **6 disconnects** per service grouped in any location.
30. When a circuit breaker handles are operated vertically rather than horizontally, the "up" position of the handle shall be the **ON** position.

31. AC equipment on board watercraft shall operate satisfactorily at **minus 5% to plus 10%** voltage limitations.
32. Emergency power panel conductors supplying a building are tapped on **the line side of the service.**
33. Where buildings exceed three stories or 15 meters in height, overhead lines shall be arranged, where practicable, so that a clear space of at least **1,900 mm** wide will be left to facilitate title raising of ladders when necessary for fire fighting.
34. For the purpose of lightning protection, a smoke or vent stack is classified as heavy duty if the cross sectional area of the flue is greater than **0.32 m²** and the height is greater than 23 m.
35. Voltage drop shall be considered to service laterals run at **long** distance.
36. Conductors used in lightning protection system shall have no bend forming an included angle of less than **90°**.
37. Control conductors used for load management can be routed with the service entrance conductors in the same **raceway or cable.**
38. A lighting fixture shall be wired with a flexible lighting cord with a cross sectional area of NOT less than **0.75 mm²** of minimum area.
39. Service conductors shall NOT be run in such a manner as to block **openings** to buildings.
40. Continuous duty loads shall be figured at **125%** for branch circuits.
41. Enclosures for over-current devices in damp or wet locations shall be identified for use in such locations and shall be mounted so there is at least **10 mm** air space between the enclosure and the wall.
42. **Type RHW** conductor has a trade name "moisture and heat resistant rubber".
43. **Counterpoise** is a grounding conductor installed over lighting cables for the purpose of interconnecting the system ground electrodes and providing lightning protection for the cables.
44. The surge arrester for services less than 1,000 V connected by copper conductor to grounding electrode conductor or the equivalent grounding terminal shall NOT be smaller than **2 mm²**.
45. The OCPD for arc welders with transformers shall NOT exceed **200%** of the primary full load current.
46. On circuits of less than 1,000 V, the rating of the surge arrester shall be **equal to or greater than** the maximum continuous phase to ground power frequency voltage available at the point of application.
47. The long time rating used to select OCPDs to protect circuits to x-ray equipment shall be **100%.**
48. A 3.5 mm² TW copper conductor has an ampacity equal to **20 A.**
49. Which of the following statement on lighting fixtures is NOT correct?
 - ✓ Outdoor lighting fixture and associated equipment shall be permitted to be supported by trees.
 - ✓ Metal fixtures and enclosures rated at 250 V and installed up in the ceiling shall be grounded
 - ✓ Stranded conductors shall be used in wiring a fixture supporting chain and other movable flexible parts
 - ✓ **Fixtures and lighting equipment operating at over 250 V shall be grounded**

50. Conductors from the service point to the service disconnecting means are considered **service conductors**.

TEST 38: Page 385 – Page 393

1. Connection or fittings shall NOT connect grounding electrode conductors to equipment by means of **solder**.
2. Each length of non-metallic conduit shall be clearly and durably marked at least every **3,000 mm** as required.
3. Doors leading into a transformer vault shall be kept locked and access allowed only to **qualified person**.
4. Resistors and reactors shall NOT be installed in close proximity to combustible materials such that it constitutes a fire hazard. What is the minimum clearance that is required by the Code? **Ans. 300 mm**
5. The grounded conductor shall be equal to the largest **phase** conductor.
6. Completely enclosed, ventilated transformers equipped with an 80°C rise insulation may be installed in a room of **fire resistant construction**.
7. In a switchboard there shall be an air space of at least **25 mm** between the energized metal part and the door of the cabinet.
8. Electrical metallic tubing shall be securely fastened in place within **900 mm** of each outlet box, junction box, cabinet or fitting.
9. Lead-in antenna conductors for television or radio equipment shall be securely **attached & fastened** to antennas.
10. Lighting fixtures approved for damp locations shall be installed only in **damp locations**.
11. What is the metric size equivalent of 1,000 MCM? **Ans. 500 mm²**
12. Antenna conductors for television equipment shall be installed so they will not **cross** under open electric light or power conductors where possible.
13. For churches, the general lighting load shall be computed at **8 VA/m²**.
14. ***
15. Electric discharge lighting shall be connected by flexible cord if the cord is visible for **100%** of its entire length.
16. What is the latest edition of the NEC, Part 2? **Ans. 1988**

17. **Feeder** is all circuit conductors between the service equipment or the generator switchboard of an isolate plant, and the final branch circuit over-current device.
18. **Breakdown** is a disruptive discharge through insulation.
19. Insulators used to support wires under cross arms are **suspension**.
20. **Electrical non-metallic tubing** is a pliable corrugated raceway of circular cross-section with integral or associated couplings, connectors and fittings for the installation of electric conductors.
21. The scope of the PEC covers all electrical conductors including optical fiber cable and equipment installed within or to or from any of the following premises, which one is NOT included?
 - ✓ Aircraft
 - ✓ Motor vehicles
 - ✓ Railway rolling stocks
 - ✓ **All of these**
22. The maximum size of liquid tight flexible metal conduit shall be **100 mm** trade size.
23. Transformers that are installed in unsupervised locations and rated over 600 V are protected by fuses on the primary side and cannot exceed **300%** of the primary full load current.
24. Each length of intermediate metal conduit shall be clearly and durably identified at **760 mm** intervals with the letters "IMC".
25. What is the maximum rating of a molded case circuit breaker to protect a 10 hp squirrel cage induction motor rated at 230 volts, 3-phase, 60 Hz with a full load rating of 28 A?
Ans. 70 A
Size = 250% of FLA = 2.5(28) = 70 A
26. Conductors used only for grounding shall be **green, green with yellow stripes, or bare**.
27. Screw type lamp holders shall have the **grounded** conductor connected to the screw shell.
28. **Demand factor** is the ratio of the maximum demand of a system or part of a system to the total connected load of a system or the part of the system under consideration.
29. Electrical non-metallic tubing smaller than **20 mm** (outside diameter) electrical trade size shall NOT be used.
30. Fixture studs in octagonal boxes used to mount lighting fixtures are computed on the **biggest** conductor entering the box.
31. Type NM (non-metallic sheathed cable) shall be permitted for **exposed & concealed** work in normally dry locations.
32. Transformers rated over 600 V and installed in supervised locations are protected by circuit breakers on the primary side and cannot exceed **600%** of the primary full load current.
33. The unit lighting for a dwelling unit expressed in watts per square meter shall be **24 watts**.
34. A **15 A or 20 A** branch circuit shall be permitted to supply lighting units, other than utilization equipment or a combination of both.
35. Type FCC cable shall be clearly and durably marked on both sides at intervals of NOT more than **600 mm**.
36. The starting winding of an induction motor is wound **on top** of the main winding.

37. Outlet boxes are not required to have blank covers to prevent the escape of **arcs and sparks**.
38. **Type MV** is a single or multi-conductor solid dielectric insulated cable rated 2,001 volts or higher.
39. Intermediate metal conduit shall be permitted to be installed in or under cinder fill where subject to permanent moisture when protected on all sides by a layer of non-cinder concrete NOT less than **50 mm** thick.
40. **Type MC Cable** is a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape of a smooth or corrugated tube.
41. Which of the following listed materials is considered among the best insulation material for motor rewinding? (Nomex, Red fiber, Mylar, **Fish paper**)
42. Individual open conductors and cables other than service entrance cables shall NOT be installed within **3,100 mm** of grade level or where exposed to physical damage.
43. Bonding provides electrical continuity and safely conductors any **fault current that may occur**.
44. A barrier shall separate underground coaxial cable when entering **ducts, pedestals, and handholes**.
45. Heavy duty lighting tracks shall be identified to exceed **20 A** in rating.
46. Where the conduits enter a switchboard at the bottom, a sufficient space shall be provided to permit installation of the conductors in the enclosure. The minimum spacing between the bottom of the enclosure and the non-insulated bus bar shall be **255 mm**.
47. **Type FCC cable** consists of three or more flat copper conductors placed edge to edge, separated and enclosed within an insulating assembly.
48. The first choice for the grounding electrode of a separately derived system is a **building steel**.
49. A fixture frame is considered grounded if connected by **EMT or IMC** in a continuous run.
50. Non-metallic extensions shall NOT be used **as an aerial cable**.

TEST 40: Page 403 – Page 411

1. The sum of all contained conductors of an auxiliary gutter at any cross section shall NOT exceed **20%** of the interior cross sectional area of the said gutter.
2. Fluorescent lighting fixtures installed in **suspended** ceilings shall be attached to the framing of the ceiling by clips, bolts, screws, or rivets.
3. In rigid metal wiring conduit, conduits shall be supported at least every **3,000 mm**.
4. Direct burial cables or conductors with a nominal voltage of 600 V or less and passes under airport runways including adjacent areas where trespassing is prohibited, shall have a minimum cover distance of **460 mm**.
5. If the voltage level is from 250 to 600 V, the air space between the wall, door or gutter partition of any cabinet shall be at least **26 mm**.
6. For motors with a marked service factor NOT less than 1.15, the multiplying factor to be used in determining for size of overload protection shall be **125%**.
7. For a motor starter to be in sight of the controlled motor, it must NOT be more than **15 m** away.
8. Pipelines with impedance heating shall NOT operate at greater than **30 VAC**.
9. The area within **1,500 mm** horizontally from an aircraft power plant shall be classified hazardous under Class I, Division 2 location.
10. Fixture chains shall be wired with **stranded** wire from the outlet box connections to the sockets of the fixture.
11. Metal faceplates for flush mounted snap switches shall be of ferrous metal NOT less than **0.8 mm** in thickness.
12. Flexible metallic tubing smaller than **15 mm** electrical trade size shall NOT be used.
13. The sum of the cross sectional areas of all contained conductors at any cross section of the wireway shall NOT exceed **20%** of the interior cross sectional area of the wireway.
14. Where nails or screws are likely to penetrate non-metallic sheathed cable or electrical non-metal tubing, a steel sleeve or steel clip NOT less than **1.6 mm** in thickness shall be used to protect the cable or tubing.

15. An auxiliary gutter shall NOT extend a greater distance than **9,100 mm** beyond the equipment, which it supplements.
16. A clearance of NOT less than **50 mm** shall be provided from recessed fixtures and their trims, ventilating openings and other such openings in room surfaces.
17. Storage batteries in solar photovoltaic systems for dwellings shall have cells operating at less than **50 V**.
18. The minimum spacing between the bottom of enclosure and the insulated busbars, their supports and other obstructions shall be **205 mm**.
19. **Stranded wire** consists of a group of wire twisted to form a metallic string.
20. Service drop conductors passing through sidewalk accessible only to pedestrians where the voltage is limited to 300 V to ground shall maintain a vertical clearance of NOT less than **3,100 mm** at the electric service entrance to buildings.
21. Secondaries of transformers supplying voltage for impedance heating of vessels are computed at NOT less than **100%** of the heating load.
22. The ampacity of supply branch circuit conductors supplying diagnostic equipment and the current rating of the over-current protective devices shall NOT be less than **50%** of the momentary rating or **100%** of the long time rating whichever is larger.
23. In dwelling units and guestrooms of hotels, motels and similar occupancies, the voltage shall NOT exceed **250 V** nominal between conductors that supply the terminals of medium base screw shall lamp holders.
24. The grounding electrode for grounding communications system may be connected to the nearest accessible location on any of the following EXCEPT one. Which one is this?
 - ✓ **Buried interior PVC water piping system**
 - ✓ Grounding electrode conductor
 - ✓ Building structure of a concrete building
 - ✓ Grounding terminal of service equipment if provided by the utility company
25. Transformers used to step down voltage for general use are classified as **separately derived** systems.
26. For a portable motor rated at **0.33 hp** or less, the controller shall be permitted to be an attachment plug and receptacle.
27. **Class II, Division 1** – Hazardous locations in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures.
28. A fixture requiring supply wire rated higher than 90°C shall be so marked in letters **6.4 mm** high prominently displayed on the fixture.
29. Rosettes for exposed wiring shall be provided with bases that shall be high enough to keep the wires and terminals at least **13 mm** from the surface wired over.
30. Branch lighting circuits shall be protected by over-current devices NOT rated more than **20 A**.
31. Solar photovoltaic systems in a one-family dwelling units with circuits rated over **150 V** to ground while energized shall NOT be accessible to other than qualified persons.
32. Where liquidtight flexible metal conduit is installed as a fixed raceway, it shall be secured at intervals NOT exceeding **1,300 mm**.
33. **Cablebus** is an approved assembly of insulated conductors with fittings and conductor terminations in a completely enclosed ventilated protective metal housing.

34. The inner strand of ACSR is made of **steel**.
35. If two or more buildings are supplied by a grounded system from one main service, each building shall have separate **grounding electrode systems**.
36. The continuous load supplied by a branch circuit shall NOT exceed the branch circuit rating by more than **80%**.
37. **Armored cable** is a cable provided with a wrapping or metal usually steel wires or tapes, primarily for the purpose of mechanical protection.
38. In all cases where there are energized parts on the front of the switchboards or motor control centers, the working space in front of such equipments shall NOT be less than **1,000 mm** of distance.
39. Border lights shall be installed around stages in theaters on circuits rated at **20 A** or less.
40. Wirings allowed to be installed outside buildings are enumerated below EXCEPT one. Which one is this?
- ✓ Type MC cable
 - ✓ **Flat conductor cable**
 - ✓ Rigid metal conduit
 - ✓ Open wires on insulators
41. Conductors supplying a heating unit shall be calculated at **125%** times the heating load plus the blower motor.
42. Masts separate from the structure to be protected shall be a minimum of **1,800 mm** from the protected structure.
43. Lighting track conductors shall be a minimum of **3.5 mm²** or equal and shall be copper.
44. The walls and roofs of transformer vaults shall be constructed of materials that have adequate structural strength for the condition with a minimum fire resistance of **3 hours**.
45. In order to protect a personnel and prevent shock, the equipment should be connected good earth ground through the **cold water pipe**.
46. When computing the service load with the standard method, more than three fixed appliances are computed with a demand factor of **75%** of the nameplate rating.
47. When computing the service load with the standard method, a 20 kW electric space heating unit is computed at **100%**.
48. Where knobs are used, conductors shall be securely tied thereto by **tie wires** having insulation equivalent to that of the conductor.
49. A photovoltaic power source having one conductor of a 2-wire system over **150 V** shall be solidly grounded.
50. The Code requires that all energized part of electrical equipment operating at **50 V** or more shall be guarded against accidental contacts by approved enclosures.