

# KADUNA CLINICS –

TECHNICAL REQUIREMENT FOR ELECTRICAL RETROFIT INSTALLATION

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## THE DESIGN AND ENGINEERING OF OFFGRID PV SOLAR SYSTEMS FOR PRIMARY HEALTHCARE CENTERS IN KADUNA STATE

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**1 ISSUE AND REVISION RECORD**

Revision	Date	Originator	Checker	Approver	Narrative

## 2 GENERAL REQUIREMENT

1. This document is a specification of requirement for equipment / material installation, testing and commissioning of all electrical retrofit works in the Primary Health Centers (PHC)
2. The specification shall be read in conjunction with the electrical schematics, wiring drawings and technical specifications provided.
3. The contractor must have valid Electrical wiring license from the Federal Ministry of Power to work on electrical installations in the clinics.
4. At the commencement of every major task, details of work to be done and approach shall first be discussed with the client's supervisor before they are carried out at site.
5. Any clarification, misunderstanding or inability to comply with these regulations must be communicated to the client forthwith for further considerations.
6. Site alterations are not allowed unless authorized by client or his agent. Where site modifications are authorized, this must be done in accordance with manufacturer's certified drawings and instruction.
7. The scope of work includes:
  - a. Removal of all existing wirings and fittings from the building blocks.
  - b. Breaking and removal of sub-standard conduit from the walls in a careful manner as not to cause damage to other parts of the building.
  - c. Installation of new electrical wirings and fittings within each block in the PHC.
  - d. Walls, floors ceilings and other areas of the building work is carried out must be left in good and acceptable condition.
  - e. Connection of the PHC blocks to grid point of supply and the PV system point of supply using recline cables and armoured cables respectively
  - f. An installation drawing (as-installed) of the erected equipment should be provided on completion. The detailed, dimensioned as-installed drawings and data are to be submitted in four (4) hard copies and one (1) digital copy.

### 3 INSTALLATION WORK

1. The installation work should comply with standard IEC 60364 and shall provide guidance for installing all electrical systems.
2. All equipment and components will be inspected on delivery, before installation, and after installation. Any defective component will be rejected and consequently replaced.
3. Work should be carried out in such a manner as to comply with all the relevant safety regulations.
4. The drawings and electrical layout provided are to be compared with new site realities for changes like new partitioning and expansions/extensions. Any observation made are to be reported to the client representative.
5. The general appearance of the finished installation must be good.
6. Installer must comply with manufacturer's instructions and recommendations during installation
7. The installer must consider the operation stage and must install in a manner as to avoid frequent maintenance call but retain flexible operation.
8. All fitting and installation work shall be carried out to conform to the approved installation code of Nigeria
9. The installation must provide the following protection to the operator
  1. Protection against electric shock
  2. Protection against thermal effect
  3. Protection against over current

#### 3.1 Required Tools

1. A schedule of tools and portable equipment as required in the sections of work shall be provided to the client for review.
2. The following basic tools must be owned and available for work; various sizes of screw drivers, hammer, pliers, cutters, fishing tape.

#### 3.2 Conduit installations

1. All conduit installations must be properly buried in walls.
2. The space available for filling and screeding after conduit installations must not be less than 20mm.
3. Proper tool for bending of conduit pipes must be applied.
4. After laying of all conduit pipes, the client agent must inspect and signoff before further work can continue.

#### 3.3 Installation of Distribution boards, Consumer units and Changeovers

1. All distribution boards, consumer unit and changeover shall be installed at a height of not less than 2m
2. All cables shall be connected to their respective terminal via a crimped cable lug.
3. To prevent access to the grid distribution board and PV system consumer unit at the same time, the units shall be installed in separate positions that are at least 2m apart or in different directions.
4. Distribution boards and consumer units are required to comply with IEC 61439-3 for operation by ordinary people.
5. The earthing shall be a single earthing bonded to the main system earthing.

### 3.4 Cables

1. All cabling installations are to be properly labelled for easy identification.
2. Install cables neatly and securely, adequately protected against accidental damage, adverse environmental conditions and mechanical stress.
3. Cables are to be installed without joints other than at equipment and terminal fittings.
4. Cables must not pass through masonry wall without conduit cover.
5. The ends of every PVC conduit pipes must be properly sleeved and bushed to disallow any exposure of service cable.

### 3.5 Armoured Cable

1. Armoured cable must be handled carefully to avoid damage to sheath and armouring.
2. The armoured cable must not be laid on any hard, sharp or irregular object. Before laying the cable, ensure that bottom of trench is even and free of sharp stones roots or broken bottle.
3. All armour must be bonded to equipment and main earthing system.
4. Connections to devices must be made moisture proof by using PVC shrouds and cable glands.
5. Cables shall be terminated with all cable sheaths within the equipment.
6. Where trenches to lay the cables are discovered to have debris and waste soil, a sharp sand cushion shall be laid to 50mm of bed sand before laying the armoured cable in it.
7. An underground cable marker is overlaid on sand covering of 200mm on the cable before a final sand covering is laid.
8. Where two (2) or more cables are laid in same trench, there shall be a horizontal separation of at least 200mm
9. The trench dimension shall be 800x350mm, dept of cable in trench shall be 700mm.
10. Cable marker of size 400x200x50mm thick with size A142 (BS) wire mesh reinforced concrete slab shall be positioned at every 25M or change in cable direction. "LV CABLE" shall be impressed on the top of slab and laid 50mm above ground level.
11. Cables in vertical installations must be housed in outdoor, heat resistant trunking ducts.

### 3.6 Light Fitting

1. All lighting fittings with bulbs are to be installed with the appropriate tool and securely fastened.

### 3.7 Ceiling fan

1. Ceiling fans shall be suspended from a substantial hook at a height that will not endanger the users or be hazardous to anyone.
2. The speed regulator shall be installed on walls easy to sight and assessable locations.

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### 3.8 Switches

1. Switches shall be retrofitted and installed at 1400mm from the finished floor level and shall be well fitted for better functionality.
2. Sockets
  1. Retrofitting of existing sockets shall be done with good finishing.
  2. The location of sockets shall be as close to the intended appliance as possible.

## **4 DOCUMENTATION AND COMMISSIONING TEST**

At practical completion, a complete set of as-built drawings, manuals and warranty certificates shall be provided in four (4) hard copies and one (1) electronic copy.

Before connecting the installation to power supply source, a detailed pre-commissioning test, visual inspection and functional test (based on IEC 60364-6) of all works done is to be conducted in the presence of the client or his appointed agent.

### **4.1 The Required Commissioning Test:**

1. Continuity test
2. Functional test
3. Insulation resistance test
4. Earth resistance test