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Federal Ministry of Power

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2nd July, 2021

The Managing Director/CEO,
Abuja Electricity Distribution Company (AEDC)
Benin Electricity Distribution Company (BEDC)
Enugu Electricity Distribution Company (EEDC)
Eko Electricity Distribution Company (EKEDC)
Ibadan Electricity Distribution Company (IBEDC)
Jos Electricity Distribution Company (JEDC)
Kaduna Electricity Distribution Company (KAEDC)
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Ikeja Electricity Distribution Company (IKEDC)
Port Harcourt Electricity Distribution Company (PHEDC)
Yola Electricity Distribution Company (YEDC)

REMINDER ON REQUIRED TECHNICAL STANDARDS AND SPECIFICATIONS FOR THE PROPOSED PLANNED REVAMPING /REHABILITATION OF EXISTING NETWORKS NATIONWIDE BY THE DISCOS

Snapshot of Technical Requirements

I write to refer to the above subject matter and to state that this exercise which is aimed at repositioning and enhancing the stability of the Electricity Distribution networks to deliver safe, reliable and sustainable Electricity supply and also to ensure safety of lives and property is a good initiative and highly welcomed.

2. In order to ensure the full realization and reaping of the full benefits of the objectives and purposes of the program, I will like to quickly draw your attention to the following Technical Standard and Specifications requirements:

A. Electric Concrete Poles and Spannages

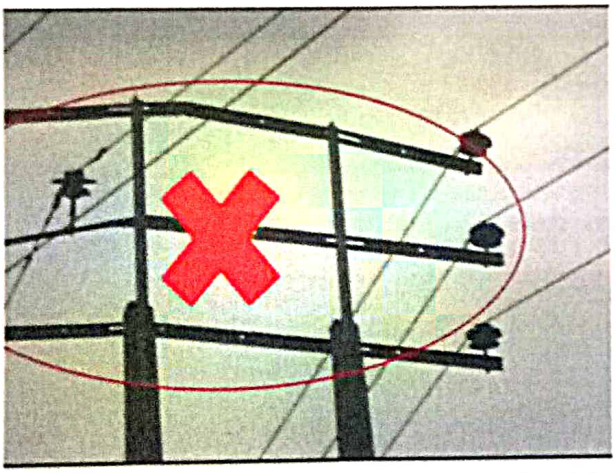
i) All Electric Concrete Poles are to be procured from only **NEMSA Certified** Electric Concrete Pole Manufacturers to ensure compliance and for traceability. The Electric Concrete Poles should have engraved- Company logo, Batch Number, Planting Depth Mark and Date of Production.

ii) Special Electric Concrete Poles of appropriate minimum height of 12.2m should be used in areas where additional heights for 10.36m poles are required to achieve necessary clearances like at Road Crossings, Railway Crossings, existing HV overhead lines etc.

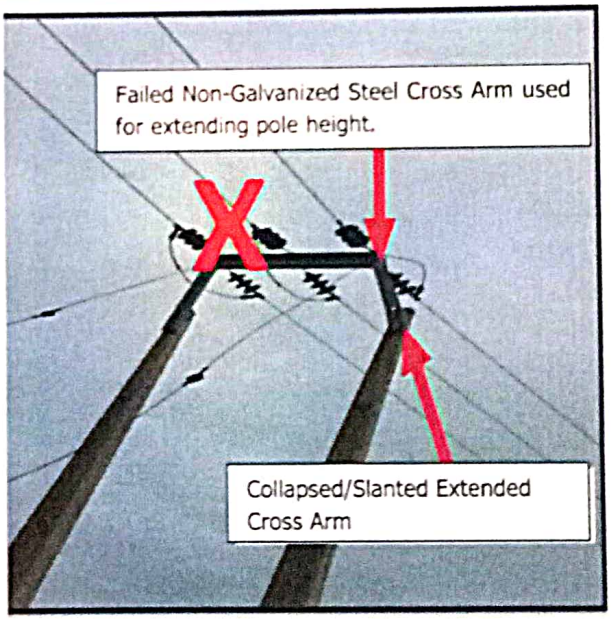
iii) Appropriate Poles Supports for Bracket Insulators: if bracket insulators are to be used, then it is mandatory to request for production/manufacturing of electric concrete poles that will support safe fixing of bracket insulators. Currently, poles meant for normal construction using channel cross arm are being adopted for bracket insulators resulting in unsafe and inappropriate fixing.

B. Unacceptable Unsafe Construction Practices

i) **Poles with channel irons**: the use of extended channel irons to increase concrete poles heights is unsafe and prohibited. Find below pictorial illustrations of the unsafe/prohibited construction practices

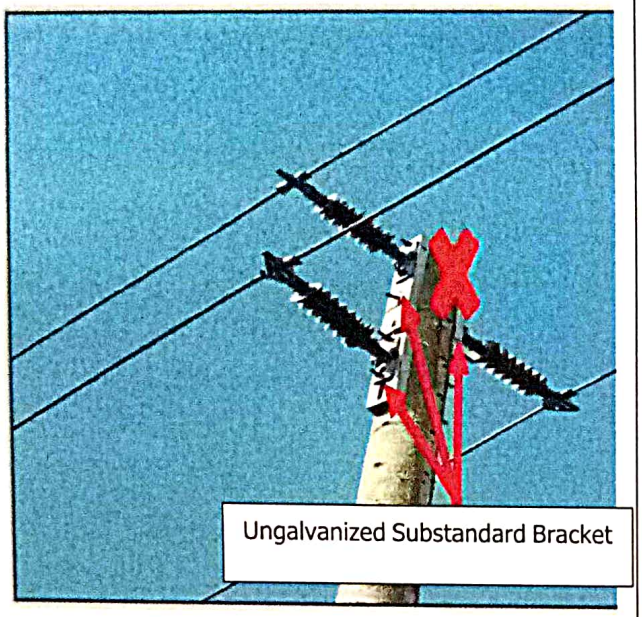


The above design cannot stand the test of time. The high-tension pole has been extended with un-galvanized channel (substandard materials) already rusted, bent and waiting to collapse as indicated in the above photograph. This network is defective in design and construction and is not acceptable. Special poles of 40ft (12.2 meters high) or 33kV steel tower, galvanized pole of appropriate height should be used for this type of construction to guarantee the stability and durability of the network as well as safety of lives and property. **The factor of safety of this type of construction and pole arrangement is zero.**

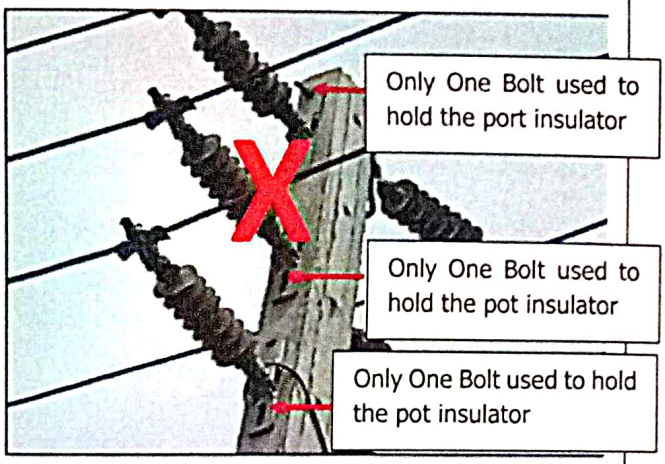


Unsafe use of inadequate length of channel iron to extend pole height; inadequate strength and stability of network results into network failure and danger to lives and property.

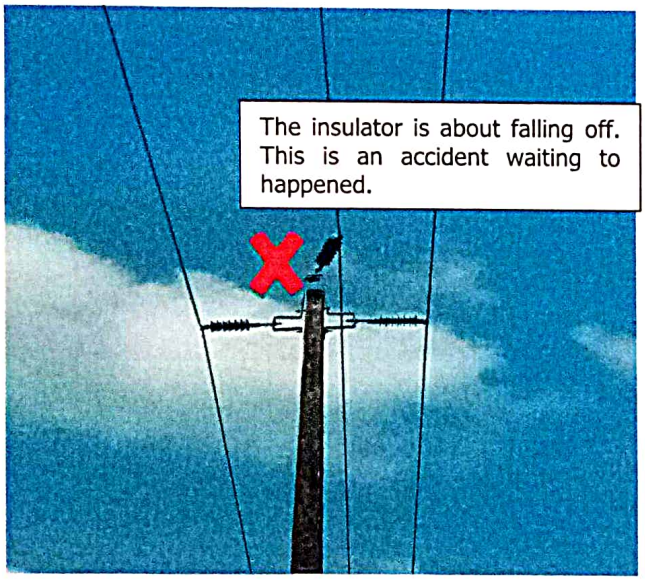
ii) **Improvised Brackets**: the use of improvised brackets to attach insulators on single poles not made for the purpose for double or single circuits construction is also prohibited and should be avoided.



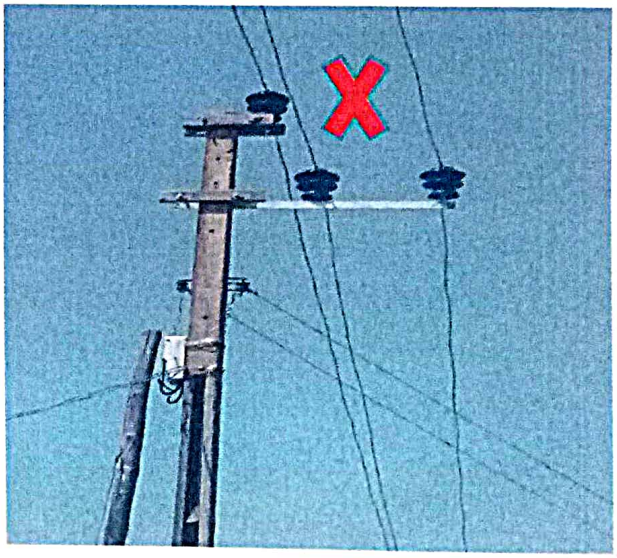
Poor installation, inadequate clearance, use of ungalvanized, improvised and bracket insulators. All these lead to instability of the networks.



One end of the bracket bolted to the pole while the other end was left open without bolt. This shows the holes are not provided as the concrete pole is not designed for this type of installation practice. Detachment of any upper phase conductor will fall on the lower phase conductors. The above 33kV double circuit primary feeder lines were seen dangerously passing over an existing 11kV substation.

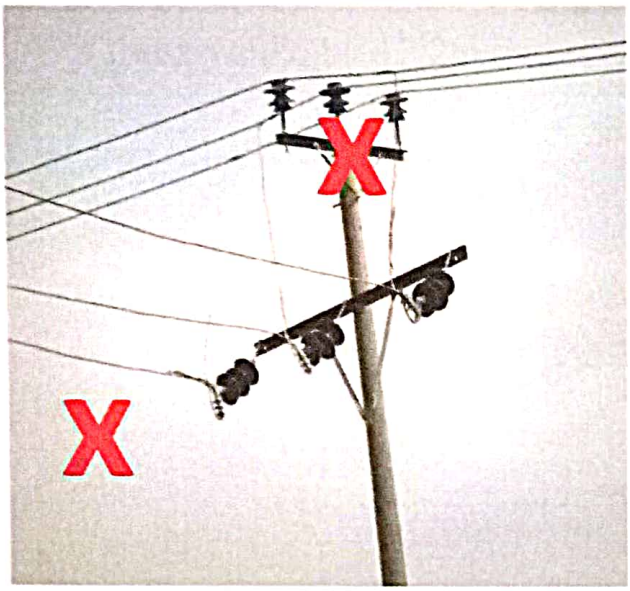


Improvised brackets already failing soon after Construction. The concrete pole is not design for this type of construction.



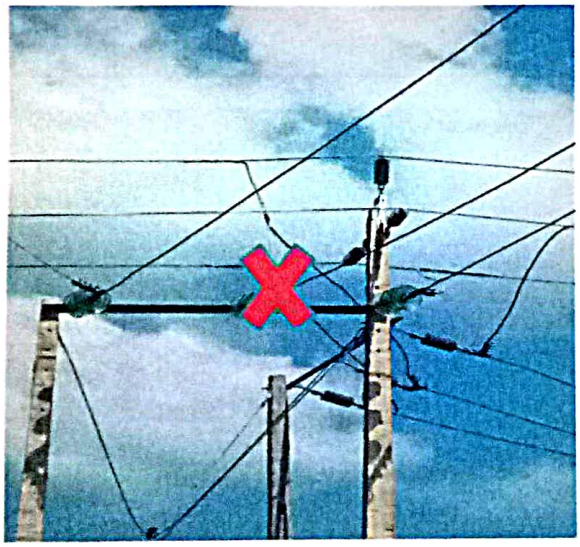
This is an improvised arrangement which cannot stand the test of time. The concrete pole is not design for this type of construction. The ungalvanized brackets can still fall-off at any time

iii) **Using a Single Pole structure for more than one T-offs**: the use of single poles structure for T-offs is prohibited, because it creates a weak point along the source existing feeder thereby leading to possible collapse of the power lines.

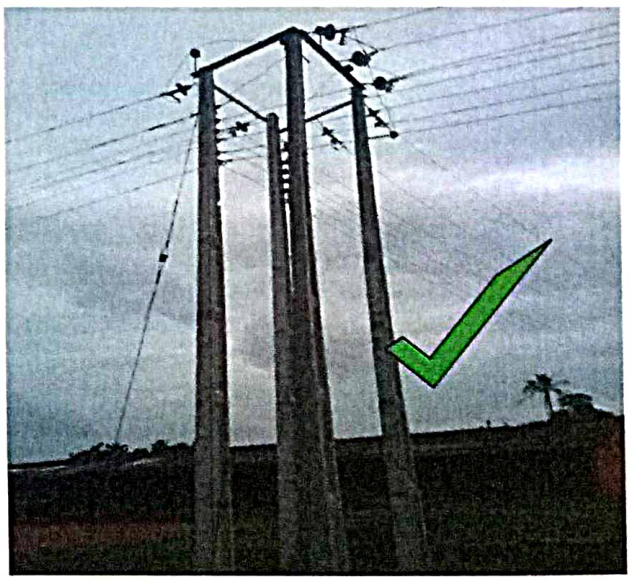


A single pole structure with un-galvanized channel iron used to T-off grid extension creates instability of the overhead line and could result to sudden failure of the O-H line after only a few years of putting the network into full use. It is very wrong to T-off with a single pole and un-galvanized channel iron. T-off with double pole

This type of three pole structure with galvanised channel iron can be used to correct the wrong single pole T-offs on the left hand picture.

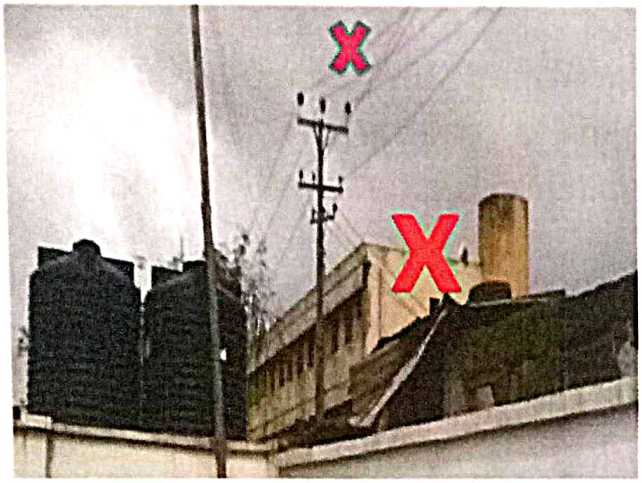


Poorly constructed T-off lead to instability of the networks and low availability of power supply to consumers

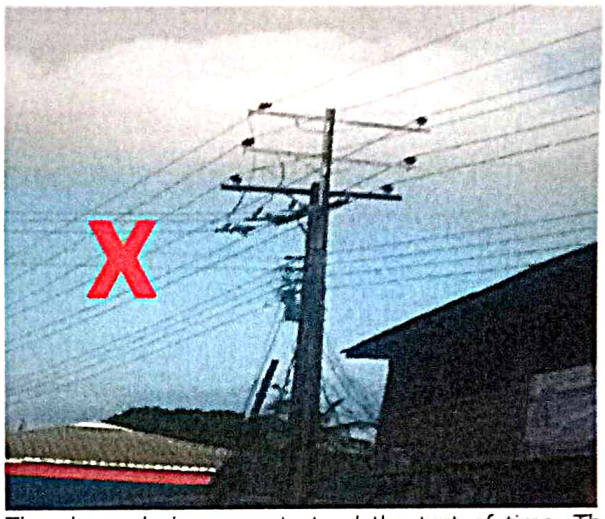


This type of four pole structure with galvanised channel iron can be used to correct this type of wrong connections on the left hand picture.

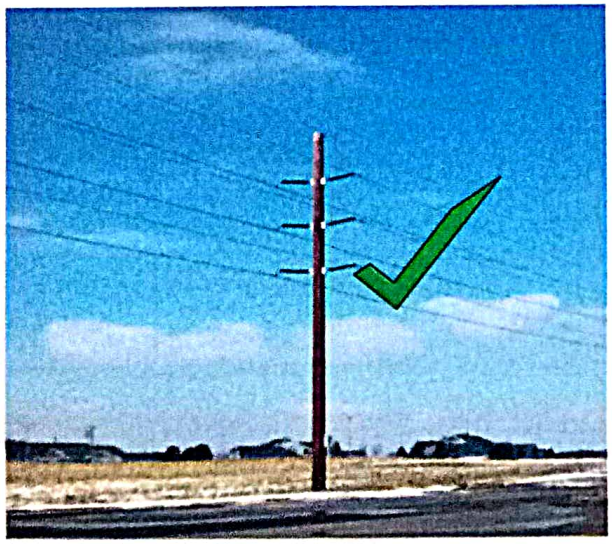
iv) **For Specific Spacings: requirements** - double circuits should be carried on cross-arms mounted on double poles structures to give the required safe spacing between the overhead circuit lines. However, if it is along a constrained corridor, the single poles to be used must have been designed for requirements of firm grip and such purpose. Examples of these would be 12.2m and special poles.



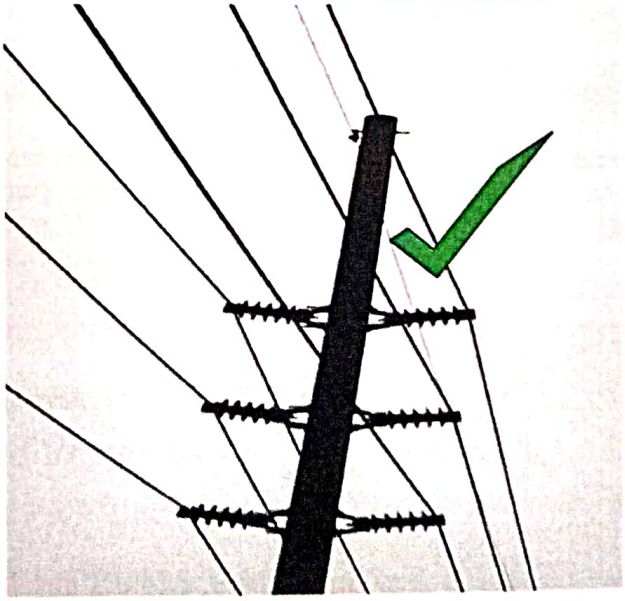
Dangerous double circuit construction of different voltage levels (33kV, 11kV) as well as wrong T-off



The above design cannot stand the test of time. The high-tension pole has been extended with un-galvanized channel (substandard materials) already rusted, bent and waiting to collapse as indicated in the above photograph. This network is defective in design and construction and is not acceptable. Special poles of 40ft (12.2 meters high) or 33kV steel tower, galvanized pole of appropriate height should be used for this type of construction to guarantee the stability and durability of the network as well as safety of lives and property**. The factor of safety of this type of construction and pole arrangement is zero.**



Good brackets that support proper spacing (separation) of circuits because the poles were specifically muddle for this type of construction.



v) **Restrictions on Pole mounted Transformers:**

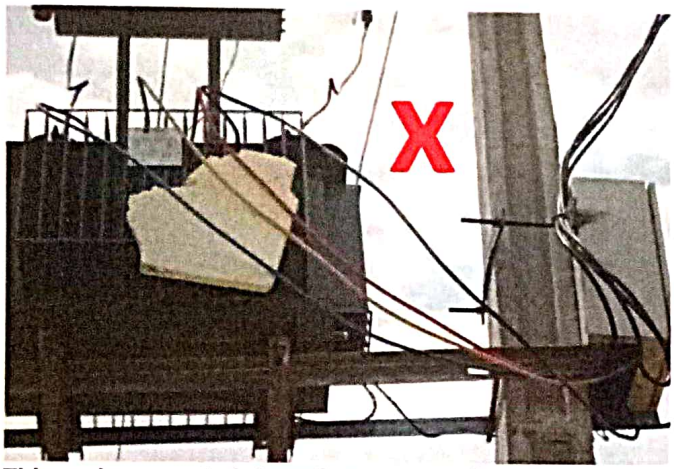
a) The capacities of transformers to be mounted on poles should not exceed 100kVA.

b) The use of ungalvanized channel irons to mount transformers on poles is prohibited.

c) The galvanized channel irons used to carry pole mounted transformers must be firmly bolted on the supporting poles.

d) The pole mounted transformers must be firmly bolted on the supporting structures at multiple/equally distributed points to maintain balance/equilibrium at all times.

Find below pictorial illustrations:



This pole mounted transformer was installed on un-galvanised rusted angle iron which could collapse any time. The split low voltage cables pass between the conservator tank and the transformer body with a spacer between them. This is an unsafe condition as the cable insulation may peel off and the spacer may also be removed which would energize the transformer body. The transformer should be mounted on galvanised support well re-enforced and armoured cable should be used.

Pole mounted transformer installed on ungalvanized (rusted) channel iron and in close proximity to a building. This is unsafe for the occupants of the house.

C. Transformers Standards and Specifications

i) Transformers must have correct specified Vector group in line with NESIS Regulations 2015 Provisions/requirements as follows;

a. Distribution Transformers (TRF) must be Dyn11 Vector group.

b. Power Transformers for Injection Substation must be Dyn1 Vector group.
c. The TRFs low voltage must be 400volts.
d. Exercise restrain/caution to avoid being deceived to buying Transformers with Aluminum Alloy windings as we had similar cases in the past which then defeated the aim/objective and purpose/essence for which the program was designed.

D. Steel Cross Arms and Angle Irons

All Steel Cross Arms and Angle Irons must be fully Galvanized type and of correct dimensions (length of 2.7m and 1.8m for 33kV and 11kV Overhead lines respectively). Non-galvanized types are unsafe and normally result in sudden collapse of networks.

E. Equipment and Materials Matching

Proper Equipment and Materials matching should be ensured for each substation. For example;

i) Don't install 400Amps feeder pillar (F/P) for a 500kVA substation with 696Amps output rather 800Amps F/P should be used.
ii) Don't use 150mm^2 armored cable for 300kVA transformer, rather use 185m^2.

F. Lightning Arrester

Lightning Arrestors must be of appropriate Voltage Rating (kA) and should be correctly positioned to serve the intended purpose and area of coverage.

G. Protection Drop out fuses

All Substations must have appropriate Drop out Fuse fittings that are functional with appropriate/proper fuse carriers.

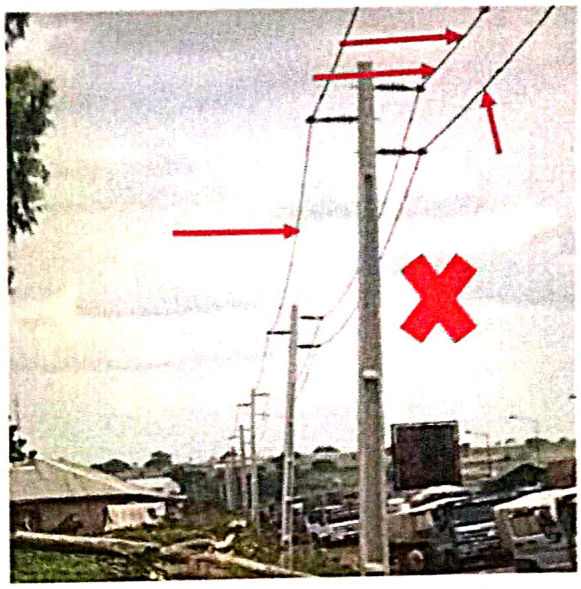
H. Conductor Type and Sizes

All Conductors must be of correct sizes as follows:

a) Primary feeder lines must be constructed with minimum of 150mm^{2}ACSR Conductors
b) 11KV feeder lines must be constructed with 100/150 mm^2 ACSR/AAC Conductors

c) All Conductors must be properly checked out/gauged as there are a lot of undersized Conductors in the market. For example, 120mm^2 being sold as 150mm^2, also 90/95mm^2 being sold as 100mm^2.

d) Avoid splitting of conductors and do not use conductors with kinks as these are likely to fail prematurely.



Overhead Conductors with severe kinks

I. Use of appropriate bi-metal line taps for connections

It is of paramount importance that all connections/joints between dissimilar Conductors (All$^+$ & Copper) must be through Bi-metallic Line Taps to avoid sparkings, Corrosion etc due to reactions between the two dissimilar Conductors.

J. Earth conductors

Ensure that all Earth Continuity Conductors are bare hard-drawn Copper type of minimum 70mm^2 size.

K. Load Balancing

Appropriate load balancing for each of the rehabilitated substation transformer must be assured to save quick and sudden damage to the transformers.

L. Use of Appropriate Pot (PIN) insulators

Appropriate pot insulator should be used for this rehabilitation. Reason: There are a lot of undersized pot insulators in the market. For example 22kV pot insulators are being sold and used for 33kV overhead lines contrary to technical standards and specifications.

M. Use of Standard Tie Straps

Tie Straps must be fully galvanized and of triangular shape formation to achieve proper alignment, firmness and stability of the Lines/network. The

U-shaped types should be completely avoided by all means and should not be used under any circumstances.

N. Use of only NEMSA Certified Electrical Installation Contractors for Project Execution

In line with Extant Electricity Supply Regulations, you are to ensure the use of only NEMSA Certified Electrical Installation Contractors for projects execution.

O. Substation Fencing

In line with extant electricity supply regulations, you are to ensure that all substations are appropriately fenced and secured with locks and keys to prevent unauthorized access. Also appropriate danger sign in *Red on White* background with skull symbol should be displayed on the entrance and side of the fence. Find below pictorial illustrations of an acceptable fenced substations.

A newly constructed standard substation with danger sign, standard fencing, gravelling.

A well designed and constructed substation in GRA, Sokoto.

3. It is Important to Note the following:

i. That the Inspection, Testing and Certification by NEMSA is mandatory for any New and Rehabilitated Network before they are put back into use.

ii. Also Note that these Exercises in 3(i) above attract statutory Testing and Certification Fees. The appropriate chargeable fees chart is attached for your ease of reference.

iii. DisCos are strictly advised to develop Standard Safety Operating Procedures (SSOP) to be adopted/followed by the Contractors during the execution of the Rehabilitation/Stabilization Projects requiring absolute care/caution as some of these Networks could be on Potential. Our respective Inspectorate Field Offices should be availed of the developed SSOP.

iv. While these projects are being executed, the Discos and their Contractors should be mindful of the required safety clearances to be maintained along the 33/11kV overhead Feeder Lines

v. Note also that from our field experiences with BEMES of Similar Projects, the actual costs of Standard Electrical Materials and Equipment are not always reflected. This has encouraged Contractors to buy substandard Electrical Materials/Equipment and refurbished transformers. For example; 33kV and 11kV galvanized cross arm and angle irons are priced in some BEMES as N15,000.00 while the actual cost for real galvanized type is about N25,000.00. It is recommended that prices of standard electrical materials and equipment be reflected in BEMEs.

vi. All protection systems and schemes must be made to perform optimally and promptly for safety of use, lives and property in line with best practice

4. In addition to the above, you and your contractors are strongly advised/encouraged to consult NESIS Regulations and the Nigerian Electrical Installations and Construction Guidelines Manual by NEMSA for further guidance and clarification in the execution of the planned revamping/rehabilitation Projects.

5. We are optimistic that if these projects are executed in line with the required technical Standards and Specifications, the following expected benefits would be realized:

i) Reduced technical losses;
ii) Improved Revenues;
iii) Improved safety in the networks;
iv) Reduced maintenance cost as the project may not require maintenance as soon as it is commissioned for use;
v) Prolonged Network Service life;
vi) Reduced incidents of electrical accidents /electrocution within the networks; and above all
vii) Meeting the requirements of extant Regulations, codes and standards.

6. Otherwise, if the standards and specifications are not adhered to, we shall have networks that go into state of disrepair soon after commissioning with attendance high maintenance cost, delivery of unreliable and unsafe power supply with consequences of exposing lives and property to serious risk and danger.

7. Having regard to the above, you are expected to use this opportunity of the Nigerian Electricity Market Stabilization fund scheme to among others execute the replacement of all existing non-compliance primary feeder lines conductors with the stipulated minimum size of 150mm^2 (ACSR) conductors and appropriate conductors for the 11/0.400kV networks.

8. By a copy of this circular, our Area Inspecting Engineers are being directed to follow-up for necessary action and compliance and to equally ensure the mandatory Inspection, Testing and Certification of the projects on completion before interconnection and use.

9. Finally, we strongly advised that the execution of the rehabilitation/stabilization projects should be preceded with proper study and design in order to avoid haphazard construction that violates safety requirements and extant Regulations/codes. Also, the anomalies described/provided above should be completely avoided in order to realize all the benefits of the programme.

10. Grateful, take note of the above for proper guidance and necessary compliance and please accept the assurances of my highest regards.

Engr. Peter O. Ewesor
Managing Director/CEO &
Chief Electrical Inspector of the Federation

CC: The Chairman,
Nigerian Electricity Regulatory Commission (NERC).