

Guidelines and Approval for the Use of Steel Distribution Poles

The Rural Development Utilities Programs will consider a borrower's written request to use steel distribution poles for site specific projects on a case-by-case trial basis to gain experience. In this guideline, "agency" refers to Rural Development Utilities Programs Electric Program.

Before granting approval, the agency needs sufficient information to assure that the application of steel poles will result in safe and reliable construction and meet agency requirements.

Borrowers requesting agency approval to use steel distribution poles are asked to read the following guidelines and design information and to furnish the agency with the information requested in Part II.

Part I: Guidelines and Design Information for Using Steel Distribution Poles

A: MATERIALS

Except for various miscellaneous material items, agency regulations require that borrowers use materials that the agency has fully, conditionally or technically accepted. A compilation of fully and conditionally accepted materials may be found in Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of USDA Rural Development Electrification Borrowers" (List of Materials). This List of Materials can be accessed through the internet at:
<http://www.usda.gov/rus/electric/listmat/index>.

For information on technically accepted items and other questions regarding materials, please contact:

Mr. Harvey Bowles, Chair
Technical Standards Committee "A" (Electric)
Rural Development Utilities Programs, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569
Phone: (202) 720-0980
Fax: (202) 720-7491
Email: Harvey.Bowles@wdc.usda.gov

Borrowers requesting agency approval of materials not presently accepted, for use with steel poles or any other application, are asked to provide: a description of the material, catalog sheets, test results, and the name and address of the manufacturer. Such requests should be sent to the appropriate regional Engineering Branch Chief. (See Section G)

B: LIGHTNING IMPULSE WITHSTAND STRENGTH and SURGE PROTECTION

A lightning impulse withstand strength, often called Basic Impulse Insulation Level or BIL, of less than 300 kV on distribution pole top assemblies will usually facilitate flashovers of lightning strikes to or near distribution lines. A recloser operation, which will cause lights to flicker, is usually required to clear the resulting arc. The agency advocates a minimum of 300 kV withstand strength (dry flashover, phase-to-phase and phase-to-ground) to minimize recloser operations and thus improve the quality of service. This level is especially important on deadends where voltage doubling can occur.

A withstand strength of 300 kV (dry flashover) can be achieved on steel poles by using many of the standard pole-top assemblies and installing a fiberglass-reinforced plastic pole-top pin (item “b (2)” in the List of Materials) on the phase conductor attached to the very top of the pole.

A 300 kV lightning impulse withstand strength (dry flashover) can be attained on a steel pole deadend structure by installing a 24 inch (minimum length) insulated extension link (item “eu” in the List of Materials) between the primary deadend suspension insulators and the steel pole.

Borrowers do not need additional agency approval to use the above two material items or the resulting modified standard pole top assemblies.

The designated maximum transverse load on fiberglass-reinforced plastic pole-top pins is 500 pounds. The maximum line angles for this loading limitation can be found in Table I, Section A of Bulletin 1728F-803, “Specifications and Drawings for 24.9/14.4 kV Line Construction.”

The installation of surge arresters at 800 foot to 1,200 foot intervals and at deadends on all distribution lines exposed to frequent lightning strikes is recommended. This recommendation is especially applicable to distribution lines built with steel poles because of their lower lightning impulse withstand strengths. An adequate number of installed surge arresters minimize the number of lightning flashovers and the resulting momentary outages and damaged insulators.

C. GROUNDS, GROUNDING

The National Electrical Safety Code (NESC) requires that all non current-carrying metallic members on a line support structure be effectively grounded. Thus, each steel pole needs to be effectively bonded to all primary and secondary neutrals, down guys, messengers, and all other metallic attachments to the pole. Other NESC grounding requirements may also apply.

A steel pole may be used as a grounding conductor if the pole meets the sufficient conductivity and low impedance requirements of the NESC.

Since a directly embedded steel pole is not recognized in the NESC as a grounding electrode, separate driven ground rods or grounding electrodes need to be used for all equipment, surge arresters and other required system grounds. The use of stainless steel or galvanized steel ground rods and non-copper ground wires in the soil near steel pole distribution lines will help to mitigate the corrosive effects of dissimilar metals buried in close proximity.

D: COSTS AND ECONOMIC STUDIES

RUS does not require borrowers to provide any economic studies or cost comparisons to justify the use of steel distribution poles instead of wood poles. However, borrowers are encouraged to compare the initial and long-term estimated installed cost of equivalent distribution structures or lines constructed with steel poles versus wood poles. Borrowers may, at their discretion, furnish the results of their cost estimates to RUS.

Questions or comments regarding Sections B through D above are welcomed by and should be sent to:

Donald Junta, Distribution Branch Chief
Rural Development Utilities Programs, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569
Phone: (202) 720-0486
Fax: (202) 720-7491
Email: Donald.Junta@wdc.usda.gov

E: RAPTOR PROTECTION USING STEEL POLES

Distribution lines should be designed and constructed in a way that will minimize the electrocution of raptors. Distribution construction with steel poles needs extraordinary consideration because of the short distances between the bare energized phase conductors and the grounded steel pole.

On single-phase lines, the installation of 24-inch long fiberglass-reinforced plastic pole-top pins (“item b (2)” in the List of Materials) will minimize the electrocution of small raptors. On three-phase lines, some raptor protection can be achieved in an economical manner by installing fiberglass-reinforced pole-top pins and perch guards on the crossarms as shown on assembly VP3.3G in Bulletin 1728F-803.

Good raptor protection can be achieved on both single-phase and three-phase structures by:

- ◆ Installing 24-inch long fiberglass-reinforced plastic pole-top pins;
- ◆ Using non-metallic crossarms and covering the pole, from the neutral up to and including the top of the pole, with an insulating coating that has a dielectric strength of at least 15,000 volts; and,
- ◆ Using 36 inch (minimum length) fiberglass-reinforced plastic guy strain insulators (item “w”) and extension links (item “eu”) for all connections to the pole above the neutral position. (See Bulletin 1728F-803, assemblies VA5.4 and E5.1G)

Any questions or comments regarding raptor protection can be directed to:

Dennis Rankin
Rural Development Utilities Programs, Stop 1571
1400 Independence Avenue SW
Washington DC 20250-1569
Phone: (202) 720-1953
Fax: (202) 720-1820
Email: Dennis.Rankin@wdc.usda.gov

F: SELECTION OF STEEL DISTRIBUTION POLES

Generally, a wood pole cannot be replaced with a steel distribution pole of the same class because of NESC strength requirements. After the selection of the NESC grade of construction, certain “design load” calculations are required to determine the minimum class of a steel distribution pole that can be used in lieu of a wood pole for standard RUS pole-top assemblies. The calculations involve the overload factors and strength factors, for both wood and steel poles, as found in Tables 253-1 and 261-1A of the 2007 edition of the NESC.

Agency regulations require a minimum of NESC Grade C construction in the design and construction of distribution lines and structures. Section 24, Grades of Construction, of the NESC, and the agency may require higher grades of construction for certain conditions.

Deadend structures and line angle structures where the transverse loads are more than 500 pounds per conductor involve additional calculations (such as loading trees) to determine the required minimum steel pole strength and pole class. The agency recommends that these types of structures (and steel pole selection) be designed (1) under the direction of a registered professional engineer, and (2) meet NESC Grade B strength requirements.

The design of unguyed angle and dead-end steel pole structures should consider pole deflection and greater embedment depths. Extreme ice conditions and appropriate high winds should be considered in the design loads.

Questions or comments regarding proper selection and installation of steel poles should be sent to:

Donald Heald, Engineer
Rural Development Utilities Programs, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569
Phone: (202) 720-9102
Fax: (202) 720-7491
Email: Don.Heald@wdc.usda.gov

G: REQUEST FOR RUS APPROVAL TO USE STEEL DISTRIBUTION POLES

Borrowers requesting agency approval to use steel distribution poles should send their written request and supporting information to the appropriate regional Engineering Branch Chief at the address given below.

Charles M. Philpott, Chief
Northern Engineering Branch
Rural Development Utilities Programs, Stop 1566
1400 Independence Avenue SW
Washington DC 20250-1566
Phone: (202) 720-1432
Fax: (202) 720-1411
Email: Charles.Philpott@wdc.usda.gov

or

Louis Riggs, Chief
Southern Engineering Branch
Rural Development Utilities Programs, Stop 1567
1400 Independence Avenue SW
Washington DC 20250-1567
Phone: (202) 720-8437
Fax: (202) 720-0097
Email: Lou.riggs@wdc.usda.gov

Part II: Information Needed by Rural Development Utilities Programs for Case-by-Case Approval of Steel Distribution Poles

Before granting approval, RDUP needs all of the information requested below to determine if the steel pole application will result in safe and reliable construction and meets all agency requirements.

1. Indicate the maximum number of steel poles to be used.
2. Indicate the name of the steel pole manufacturer.
3. Define the project or location(s) where the steel poles will be installed.
4. In addition to “experimental purposes to obtain experience”, furnish sound reason(s) for using steel poles.
5. Indicate that only agency accepted materials are to be used. (*Otherwise, see Section A of steel pole guidelines.*)
6. Indicate that only agency standard construction is to be used. (*Otherwise, see Sections A and B of steel pole guidelines. Please furnish sufficient dimensioned drawings and other technical information for agency evaluation of the design.*)
7. (*If, and only if, the design has less than a 300 kV withstand strength [see guidelines, Section B], then briefly describe assemblies and materials to be used and anticipated impact [if any] on reliability and materials.*)
8. Describe raptor protection measures, if any that are to be incorporated into the design. (*See guidelines, Section D.*) (*Note that the agency recommends that raptor protection be considered in distribution line designs, especially lines using steel poles, even though neither all lines nor all areas may require raptor protection.*)
9. Indicate that the determination of the class of the steel poles for each application is based on the proper engineering calculations performed by a competent person. (*See guidelines, Section F.*)