UNITED STATES

DEPARTMENT OF AGRICULTURE

# RURAL UTILITIES SERVICE

## SUMMARY OF

## ITEMS OF ENGINEERING INTEREST

## AUGUST 2002

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# ABBREVIATIONS

| | |
|---|---|
| ACI | American Concrete Institute |
| AGL | Above Ground Level |
| AISC | American Institute of Steel Construction |
| ANSI | American National Standards Institute |
| APLIC | Avian Power Line Interaction Committee |
| ASCE | American Society of Civil Engineers |
| ASTM | ASTM International (formerly American Society for Testing and Materials) |
| AWG | American Wire Gauge |
| BIL | Basic Impulse Insulation Level |
| CCA | Chromated Copper Arsenate |
| CFR | Code of Federal Regulations |
| CIS | Consumer Information Sheets |
| CT | Current Transformer |
| DCS | Data Collection System |
| EEI | Edison Electric Institute |
| ESD | Electric Staff Division |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FTP | File Transfer Protocol |
| GFI | Ground Fault Interrupter |
| HTTP | Hypertext Transfer Protocol |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISP | Internet Service Provider |
| kV | Kilovolt |
| kVA | Kilovolt-Amperes |
| MBTA | Migratory Bird Treaty Act |
| MOU | Memorandum of Understanding |
| NEMA | National Electrical Manufacturers Association |
| NESC | National Electrical Safety Code |
| NFEC | National Food and Energy Council |
| NRECA | National Rural Electric Cooperative Association |
| REA | Rural Electrification Administration |
| RESAP | Rural Electric Safety Accreditation Program |
| RUS | Rural Utilities Service |
| RUS List of Materials | RUS Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers" |
| SPB | Southern Pine Beetle |
| T&D | Transmission & Distribution |
| TSC "A" | Technical Standards Committee "A" (Electric) |
| USFWS | U.S. Fish and Wildlife Service |

# DESIGN and CONSTRUCTION

## Current Events in the NESC

Strengths and Loadings, Sections 25-27

NESC Subcommittee 5, *Strengths and Loadings*, WG 5.2, is continuing its efforts to develop a complete re-write of the strength and loading sections (Sections 25–27). The corresponding change proposal (CP 2372-revised) addresses the 2007 Edition of the NESC. The change proposal will attempt to introduce this rewrite as (1) a replacement to the respective sections in the 2002 Edition, or (2) an alternative method in the 2007 Edition. Since an important part of this revision would incorporate an ice (plus concurrent wind) map based upon a 50-year recurrence interval (ASCE 7 map), the radial ice indicated would be significantly greater than that presently specified by the Loading Districts in the 2002 and earlier editions. Furthermore, since the clearance rules of Section 23 are presently based upon conductor sag and tension under the same ice loads specified in the loading map in Section 25, the resultant sags may be considerably increased with the inclusion of the ASCE 7 ice/wind map, severely aggravating the ability of the utilities to meet minimum clearance requirements.

Subcommittee 4, *Overhead lines – Clearances,* established WG 4.10, to work in cooperation with WG 5.2, to investigate the corresponding impact on sag and clearance issues, and to develop appropriate change proposals compatible with the possible introduction of the new method. It is noted that it is likely that other change proposals will be submitted to Subcommittee 5 that will independently propose the incorporation of the new ASCE 7 ice/wind map.

Incorporation of the new ASCE 7 ice/wind map would have a major impact on sag and clearance issues for both distribution and transmission facilities, depending upon the geographic area, span length, and conductor. Several possible options were discussed for addressing this critical issue within WG 4.10 and Subcommittee 4.

60-Foot Exclusion

Subcommittee 5, *Strengths and Loadings*, established working group 5.8 to revisit the 60-foot height limit for extreme winds in the 2002 NESC. Rule 250C, Extreme Wind Loading, states:

> *"If no portion of a structure or its supported facilities exceeds 60 ft. above ground or water level, the provisions of this rule* (Extreme Wind Loading) *are not required, except as specified in Rule 261A1c or Rule 261A2f."*

The original change proposal to the 1997 edition of the code was to remove the 60-foot exclusion from Rule 250C. Comments from the public and from members of the committee seem to indicate that removal of the 60-foot exemption would not necessarily increase safety and reliability. During extreme wind events, debris is blown into overhead line facilities (especially those under 60 feet), which has a more dramatic effect on the line than does extreme wind. Removal of this exemption ignores this problem while imposing a possible costly solution.

However, the subcommittee recognizes that wind blows below 60 feet and has asked this working group to develop a position that would accommodate both opinions for the 2007 edition of the NESC.

If you would like more information or have any questions, please contact Donald Heald, Structural Engineer, Transmission Branch, at 202-720-9102 or at dheald@rus.usda.gov.

## Future New 15 KV Construction Standards

The Rural Utilities Service (RUS) is working on updating and revising Bulletin 50-3 (Standard D 804, April 1983,) "Specifications and Drawings for 12.5/7.2 kV Line Construction." The updated bulletin would be renumbered as Bulletin 1728F-804 and incorporate the requirements of the 2002 edition of the National Electrical Safety Code (NESC). A draft of the revised bulletin is nearly complete. The bulletin is expected to be published as a proposed rule in the *Federal Register* in the fall of 2002.

The new bulletin will be very similar in appearance and content as Bulletin 1728F-803 "Specifications and Drawings for 24.9/14.4 kV Line Construction," dated December, 1998. As such, it would contain the following significant changes.

- Assembly categories, like "anchors," are groups of assemblies that fulfill the same function. In the new bulletin, the "A" through "K" categories will remain essentially unchanged. Nine new categories would be created from the "M" (miscellaneous) subcategories as shown in the following table. (Miscellaneous assemblies not shown in the table will either be moved to another specific category or discontinued.)

| Category Description | Old Designation | New Designation |
|---|---|---|
| Grounds | M2 | H |
| Pole (and Line) Protection | M2 | P |
| Reclosers | M3 | R |
| Poles, Crossarms | M5, M19, M20 | W |
| Sectionalizing | M3, M5 | S |
| Voltage Regulation | M7 | Y |
| Metering | M8 | Q |
| Services | M8, M24 | K |
| Tying Guides | M41-M43 | L |
| Neutrals | - - - | N (new category) |

- The addition of new assembly categories and the reorganization of the bulletin will make it easier to find specific assemblies. The specifications for each category will be conveniently located in the same section as the drawings for the assembly category. Also, all of the pole-top primary assemblies will be arranged in ascending order of permitted line angles. All of the possible line angles will also be included.

- New assemblies will be given numbers that conform to RUS' updated standard assembly numbering format explained in Bulletin 1728F-800 "Assembly Unit Numbers and Standard Format." For the 127 assemblies expected to be reused from Bulletin 50-3, borrowers would be able to continue to use the existing numbers or may choose to use new numbers in the standard format.

- The new pole-top primary deadend assembly drawings will show the use of 4-1/4 inch suspension insulators instead of 6-inch suspension insulators. This is only a drawing revision and would not require borrowers to make any changes in their present construction practices or material lists.

- RUS will specify (now recommends) the installation of a 2-1/4 inch square washer under the shoulder of all 7.2 kV crossarm pins. Likewise, RUS will specify (now recommends) the installation of a 3-inch square, curved washer abutting the pole on all primary, neutral and guy deadends. These changes will allow larger line angles and greater longitudinal loading (tension) for conductors and guys. The larger surface area of the washers mitigates the crushing of wood fibers, which is the limiting strength factor in these types of pole-top assembly units.

- The drawings will have "design parameters" that show each assembly's permitted loading and maximum line angles when applicable. New maximum line angle and permitted crossarm longitudinal loading tables will appear in appendixes at the end of the bulletin. The use of these tables will save engineering time (no calculations required) and assure greater accuracy and conformance to the NESC.

- The new construction standards would allow the conditional use of stirrups without further approval from RUS.

- The new bulletin will have a coordinated set of new standard narrow profile assemblies.

- The number of assemblies and guide drawings proposed for change are shown below:

| | **Bulletin 50-3** | | **New 1728F-804** |
|---|---|---|---|
| Number of New Assemblies | 0 | | 43 |
| New Guide Drawings (No Material) | 0 | | 50 |
| Revised - No Material Changes | 73 | (reused) | 73 |
| Revised - Minor Material Changes | 54 | (reused) | 54 |
| Discontinued Drawings, Assemblies | 115 | | 0 |
| TOTAL DRAWINGS AND ASSEMBLIES | 242 | | 220 |

Construction personnel, engineers and others will eventually need to become familiar with approximately 43 new assemblies, some new assembly numbers and slight material changes on 54 existing assemblies.

Moreover, most borrowers will need to modify computer software and databases for engineering, accounting, and work order procedure programs to accommodate any assembly changes. Making these changes might be relatively easy and straightforward for some borrowers. Making needed software changes may cause problems to those borrowers who do not have enough flexibility in their software or do not reserve enough time to make changes. The required changes are: removing 115 old assemblies; slight material changes (mostly washers) to 54 assemblies; and adding some of the new assemblies as needed.

When the Proposed Rule is published in the *Federal Register,* we recommend that you obtain a copy of the proposed bulletin and scrutinize its drawings and specifications. Please send us your comments, suggestions, and error corrections. Our goal is to make the bulletin error free and as user friendly as possible.

**We recommend that you examine all existing (and potential new) engineering and accounting software linked to RUS standard construction assemblies to ascertain that they can easily be utilized to add, delete and change construction assembly numbers and materials.** Make modifications as may be necessary. Thus, you may be able to avoid extensive and time-consuming problems when Bulletin 1728F-804 becomes effective.

If you would like more information or have any questions, please contact Jim Bohlk, Electrical Engineer, Distribution Branch, at 202-720-1967 or at jbohlk@rus.usda.gov.

## Longitudinal Loading on Crossarm Assemblies

The Rural Utilities Service (RUS) recently re-evaluated the mechanical loading on RUS standard distribution crossarm assemblies. The results of this re-evaluation are documented in a forthcoming RUS Bulletin 1724E-151, "Mechanical Loading on Distribution Crossarms," that contains equations, data and explanatory information. As a result of this work, the "allowable longitudinal loading" values shown in the design parameters on the drawings of RUS Bulletin 1728F-803, "Specifications and Drawings for 24.9/14.4 kV Line Construction," are being revised using the following equations and methodology.

**Borrowers are encouraged to use the values for the "permitted unbalanced conductor tension" in the following Tables 1 and 2 instead of the "allowable longitudinal load" values given for the crossarm assemblies on the 24.9/14.4 kV construction drawings.**

Applied vertical loads need to be considered when determining the permitted longitudinal loading of crossarm deadend assemblies. The following mathematical relationship, which relate

vertical and longitudinal loading, has to be satisfied to avoid overstressing the wood fibers of crossarms:

$$\frac{\sum Applied\ Vertical\ Moments}{Permitted\ Vertical\ Moment\ (Capacity)} + \frac{\sum Applied\ Longitudinal\ Moments}{Permitted\ Longitudinal\ Moment\ (Capacity)} \leq 1$$

The following applies to RUS standard distribution, deadend, crossarm assemblies:

- *Permitted Vertical Moment (Capacity) of Assembly = N x $M_v$ x $F_s$*
- *Permitted Longitudinal Moment (Capacity) of Assembly = N x $M_h$ x $F_s$*
- $\Sigma$ *Applied Vertical Moments* =

  $$D_1 \times \left[\left(S_{in} \times W_1\right) + \left(S_{out} \times W_2\right)\right] \times F_{OLV} + D_2 \times \left[\left(S_{in} \times W_3\right) + \left(S_{out} \times W_4\right)\right] \times F_{OLV} + M_{LW}$$

  (See Diagram 1 below.)
- $\Sigma$ *Applied Longitudinal Moments* =

  $$\left[D_1 \times \left(L_{1-in} - L_{1-out}\right) + D_2 \times \left(L_{2-in} - L_{2-out}\right)\right] \times F_{OLL}$$

The units of measure of the above four groups of terms are "ft-lbs." Note that all of the calculations apply to one-half of the crossarm assembly (on either the right or left side of the pole looking parallel to the line). Each conductor attachment location, at a distance $D_1$ or $D_2$ from the center of the assembly, has either one conductor attached ("into" the assembly) or has two back-to-back conductors attached (one "into" and one "out from" the assembly).

Following are the definitions and values of the variables in the above equations:

| | | | |
|---|---|---|---|
| $M_v$ | = | 7,650 | Vertical crossarm moment (capacity) (ft-lbs) |
| $M_h$ | = | 5,060 | Longitudinal crossarm moment (capacity) (ft-lbs) |
| $M_{LW}$ | = | 1,000 | Load moment attributed to weight of lineworker (ft-lbs) |
| $F_s$ | = | 0.85 | Strength Factor (2002 NESC Table 261-1A) - Grade C |
| | = | 0.65 | Strength Factor (2002 NESC Table 261-1A) - Grade B |
| $F_{OLV}$ | = | 1.90 | Overload factor - Vertical (2002 NESC Table 253-1) - Grade C |
| | = | 1.50 | Overload factor - Vertical (2002 NESC Table 253-1) - Grade B |
| $F_{OLL}$ | = | 1.30 | Overload factor - Longitudinal (2002 NESC Table 253-1) - Grade C |
| | = | 1.65 | Overload factor - Longitudinal (2002 NESC Table 253-1) - Grade B |
| $D_1$ | = | 1.75 | Distance to nearest conductors on 10-foot crossarm assemblies (ft) |
| $D_2$ | = | 4.50 | Distance to farthest conductors on 10-foot crossarm assemblies (ft) |
| $D_1$ | = | 3.50 | Distance to conductor(s) on 8-foot crossarm assemblies (ft) |
| $W_i$ | = | | Vertical unit weight of conductor plus NESC ice and wind loads (lbs/ft) |
| $S_{in}$ | = | | One-half of the total span length "into" the assembly (ft) |
| $S_{out}$ | = | | One-half of the total span length "out from" the assembly (ft) |
| $N$ | = | | Number of crossarms |
| $L_{in}$ | = | | Tension of each conductor “into” the assembly (lbs) |
| $L_{out}$ | = | | Tension of each conductor “out from” the assembly (lbs) |

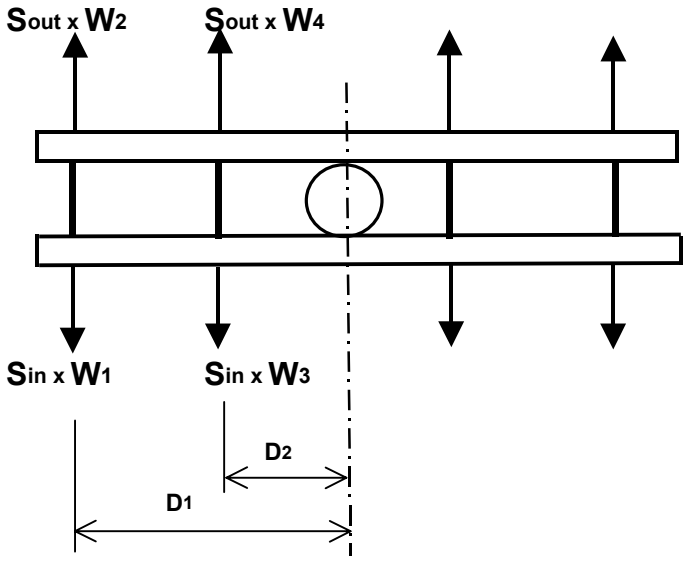



**Diagram 1**

For purposes of simplifying mechanical loading calculations, the following assumptions and approximations are made:

- All of the conductor spans “into” a crossarm assembly have the same length; all of the conductor spans “out from” a crossarm assembly have the same length. The length “*S*,” where $S = S_{in} + S_{out}$, is called a “*weight span.*”

- The tensions of all of the conductors into the crossarm assembly ($L_{in}$) are the same; the tensions of all of the conductors out from the crossarm assembly ($L_{out}$) are the same. "*L*" is the difference of the conductor tensions ($L = L_{in} - L_{out}$) at each (phase) conductor attachment location on the assembly.

- All of the conductors attached to the crossarm assembly are the same type and size as the largest conductor. Thus in the above equation: $W_1 = W_2 = W_3 = W_4 = W$.

- A load moment ($M_{LW}$ ) of 250 pounds (which might be attributed to a lineworker, materials or equipment) times 2 feet and times a constant overload factor of 2.0 (the product equals 1,000 ft-lbs) is added to the applied vertical load moments to satisfy NESC Rule 261D4b requirements. (***Note: Standard construction practices and RUS discourage lineworkers from standing on crossarms.***)

After applying the above assumptions and substitutions, the equation can be simplified and re-written as:

$$\frac{(D_1 + D_2) \times (W \times S) \times F_{OLV} + 1{,}000}{N \times M_v \times F_s} + \frac{(D_1 + D_2) \times L \times F_{OLL}}{N \times M_h \times F_s} \leq 1 \quad \text{(ft-lbs)}$$

This equation can be solved for "*L*" as a function of all of the other variables in the equation. Tables 1 and 2 show the calculated *permitted unbalanced conductor tensions* ("*L*") for several commonly used distribution conductors versus three different weight spans ("S"), for standard RUS crossarm deadend assemblies and NESC Grade C construction.

If you would like more information or have any questions, please contact Jim Bohlk, Electrical Engineer, Distribution Branch, at 202-720-1967 or at jbohlk@rus.usda.gov.

# TABLE 1

## PERMITTED UNBALANCED CONDUCTOR TENSION ( Lbs / Phase )*

**SINGLE and DOUBLE DEADEND ASSEMBLIES; 1 PHASE EACH SIDE OF POLE- NESC Grade C**

| CONDUCTOR SIZE | Vertical Loading (lbs/ft) | 2 CROSSARMS WEIGHT SPANS** (feet) 200 | 300 | 400 | 3 CROSSARMS WEIGHT SPANS** (feet) 200 | 300 | 400 |
|---|---|---|---|---|---|---|---|
| **NESC LIGHT LOADING DISTRICT** (0.00" Ice; 9 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.0670 | 1,730 | 1,720 | 1,710 | 2,670 | 2,670 | 2,660 |
| 2 ACSR (6/1) | 0.0913 | 1,720 | 1,710 | 1,700 | 2,670 | 2,660 | 2,650 |
| 123.3 AAAC (7) | 0.1157 | 1,720 | 1,710 | 1,700 | 2,660 | 2,650 | 2,640 |
| 1/0 ACSR (6/1) | 0.1452 | 1,710 | 1,700 | 1,680 | 2,660 | 2,640 | 2,630 |
| 2/0 ACSR (6/1) | 0.1831 | 1,700 | 1,690 | 1,670 | 2,650 | 2,630 | 2,610 |
| 3/0 ACSR (6/1) | 0.2309 | 1,700 | 1,670 | 1,650 | 2,640 | 2,620 | 2,600 |
| 246.9 AAAC (7) | 0.2318 | 1,700 | 1,670 | 1,650 | 2,640 | 2,620 | 2,600 |
| 4/0 ACSR (6/1) | 0.2911 | 1,680 | 1,660 | 1,630 | 2,630 | 2,600 | 2,570 |
| 312.8 AAAC (19) | 0.2936 | 1,680 | 1,650 | 1,630 | 2,630 | 2,600 | 2,570 |
| 336.4 ACSR (18/1) | 0.3653 | 1,670 | 1,630 | 1,600 | 2,610 | 2,580 | 2,540 |
| **NESC MEDIUM LOADING DISTRICT** (0.25" Ice; 4 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.2247 | 1,700 | 1,670 | 1,650 | 2,640 | 2,620 | 2,600 |
| 2 ACSR (6/1) | 0.2673 | 1,690 | 1,660 | 1,640 | 2,630 | 2,610 | 2,580 |
| 123.3 AAAC (7) | 0.3172 | 1,680 | 1,650 | 1,620 | 2,620 | 2,590 | 2,560 |
| 1/0 ACSR (6/1) | 0.3467 | 1,670 | 1,640 | 1,610 | 2,620 | 2,580 | 2,550 |
| 2/0 ACSR (6/1) | 0.3998 | 1,660 | 1,620 | 1,590 | 2,610 | 2,570 | 2,530 |
| 3/0 ACSR (6/1) | 0.4647 | 1,650 | 1,610 | 1,560 | 2,600 | 2,550 | 2,510 |
| 246.9 AAAC (7) | 0.4846 | 1,650 | 1,600 | 1,550 | 2,590 | 2,540 | 2,500 |
| 4/0 ACSR (6/1) | 0.5439 | 1,630 | 1,580 | 1,530 | 2,580 | 2,530 | 2,470 |
| 312.8 AAAC (19) | 0.5709 | 1,630 | 1,570 | 1,520 | 2,570 | 2,520 | 2,460 |
| 336.4 ACSR (18/1) | 0.6557 | 1,610 | 1,550 | 1,490 | 2,560 | 2,490 | 2,430 |
| **NESC HEAVY LOADING DISTRICT** (0.50" Ice; 4 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.5379 | 1,640 | 1,580 | 1,530 | 2,580 | 2,530 | 2,480 |
| 2 ACSR (6/1) | 0.5989 | 1,620 | 1,570 | 1,510 | 2,570 | 2,510 | 2,450 |
| 123.3 AAAC (7) | 0.6741 | 1,610 | 1,540 | 1,480 | 2,550 | 2,490 | 2,420 |
| 1/0 ACSR (6/1) | 0.7036 | 1,600 | 1,540 | 1,470 | 2,550 | 2,480 | 2,410 |
| 2/0 ACSR (6/1) | 0.7719 | 1,590 | 1,520 | 1,440 | 2,540 | 2,460 | 2,390 |
| 3/0 ACSR (6/1) | 0.8539 | 1,570 | 1,490 | 1,410 | 2,520 | 2,440 | 2,350 |
| 246.9 AAAC (7) | 0.8927 | 1,570 | 1,480 | 1,390 | 2,510 | 2,430 | 2,340 |
| 4/0 ACSR (6/1) | 0.9520 | 1,560 | 1,460 | 1,370 | 2,500 | 2,410 | 2,320 |
| 312.8 AAAC (19) | 1.0037 | 1,550 | 1,450 | 1,350 | 2,490 | 2,390 | 2,300 |
| 336.4 ACSR (18/1) | 1.1015 | 1,530 | 1,420 | 1,310 | 2,470 | 2,370 | 2,260 |

*NOTES:* ***Reduce tabulated tensions by 40% for NESC Grade B construction.***

**(Lbs/Phase) means tension difference at each point on crossarms where conductors are attached.*

*** **Weight span** equals 1/2 span length into assembly plus 1/2 span length out from assembly.*

*Weight Span for **single deadend assembies** only equals 1/2 span length into assembly.*

*Calculations assume all conductors same size and type as largest conductor and level spans.*

*Assemblies have been multiplied by strength factor of 0.85 (2002 NESC Table 261-1A).*

# TABLE 2

## PERMITTED UNBALANCED CONDUCTOR TENSION ( Lbs / Phase )*

### DOUBLE DEADEND ASSEMBLIES - 2 PHASES EACH SIDE OF POLE - NESC Grade C

| CONDUCTOR SIZE | Vertical Loading (lbs/ft) | 2 CROSSARMS WEIGHT SPANS** (feet) 200 | 300 | 400 | 3 CROSSARMS WEIGHT SPANS** (feet) 200 | 300 | 400 |
|---|---|---|---|---|---|---|---|
| **NESC LIGHT LOADING DISTRICT** (0.00" Ice; 9 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.0670 | 960 | 950 | 950 | 1,490 | 1,480 | 1,480 |
| 2 ACSR (6/1) | 0.0913 | 950 | 950 | 940 | 1,480 | 1,480 | 1,470 |
| 123.3 AAAC (7) | 0.1157 | 950 | 940 | 930 | 1,480 | 1,470 | 1,460 |
| 1/0 ACSR (6/1) | 0.1452 | 940 | 930 | 920 | 1,470 | 1,460 | 1,450 |
| 2/0 ACSR (6/1) | 0.1831 | 940 | 920 | 900 | 1,470 | 1,450 | 1,430 |
| 3/0 ACSR (6/1) | 0.2309 | 930 | 910 | 880 | 1,460 | 1,440 | 1,410 |
| 246.9 AAAC (7) | 0.2318 | 930 | 900 | 880 | 1,460 | 1,430 | 1,410 |
| 4/0 ACSR (6/1) | 0.2911 | 920 | 890 | 860 | 1,450 | 1,420 | 1,390 |
| 312.8 AAAC (19) | 0.2936 | 920 | 890 | 860 | 1,450 | 1,420 | 1,390 |
| 336.4 ACSR (18/1) | 0.3653 | 900 | 870 | 830 | 1,430 | 1,400 | 1,360 |
| **NESC MEDIUM LOADING DISTRICT** (0.25" Ice; 4 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.2247 | 930 | 910 | 890 | 1,460 | 1,440 | 1,420 |
| 2 ACSR (6/1) | 0.2673 | 920 | 890 | 870 | 1,450 | 1,420 | 1,400 |
| 123.3 AAAC (7) | 0.3172 | 910 | 880 | 850 | 1,440 | 1,410 | 1,380 |
| 1/0 ACSR (6/1) | 0.3467 | 900 | 870 | 840 | 1,430 | 1,400 | 1,370 |
| 2/0 ACSR (6/1) | 0.3998 | 890 | 860 | 820 | 1,420 | 1,390 | 1,350 |
| 3/0 ACSR (6/1) | 0.4647 | 880 | 840 | 790 | 1,410 | 1,370 | 1,320 |
| 246.9 AAAC (7) | 0.4846 | 880 | 830 | 780 | 1,410 | 1,360 | 1,310 |
| 4/0 ACSR (6/1) | 0.5439 | 870 | 810 | 760 | 1,400 | 1,340 | 1,290 |
| 312.8 AAAC (19) | 0.5709 | 860 | 810 | 750 | 1,390 | 1,340 | 1,280 |
| 336.4 ACSR (18/1) | 0.6557 | 850 | 780 | 720 | 1,380 | 1,310 | 1,250 |
| **NESC HEAVY LOADING DISTRICT** (0.50" Ice; 4 lb Wind) | | | | | | | |
| 4 ACSR (7/1) | 0.5379 | 870 | 820 | 760 | 1,400 | 1,350 | 1,290 |
| 2 ACSR (6/1) | 0.5989 | 860 | 800 | 740 | 1,390 | 1,330 | 1,270 |
| 123.3 AAAC (7) | 0.6741 | 840 | 780 | 710 | 1,370 | 1,310 | 1,240 |
| 1/0 ACSR (6/1) | 0.7036 | 840 | 770 | 700 | 1,370 | 1,300 | 1,230 |
| 2/0 ACSR (6/1) | 0.7719 | 820 | 750 | 670 | 1,350 | 1,280 | 1,200 |
| 3/0 ACSR (6/1) | 0.8539 | 810 | 720 | 640 | 1,340 | 1,250 | 1,170 |
| 246.9 AAAC (7) | 0.8927 | 800 | 710 | 630 | 1,330 | 1,240 | 1,160 |
| 4/0 ACSR (6/1) | 0.9520 | 790 | 700 | 600 | 1,320 | 1,230 | 1,130 |
| 312.8 AAAC (19) | 1.0037 | 780 | 680 | 580 | 1,310 | 1,210 | 1,110 |
| 336.4 ACSR (18/1) | 1.1015 | 760 | 650 | 550 | 1,290 | 1,180 | 1,080 |

*NOTES:* ***Reduce tabulated tensions by 40% for NESC Grade B construction.***

**(Lbs/Phase) means tension difference at each point on crossarms where conductors are attached.*

*** **Weight span** equals 1/2 span length into assembly plus 1/2 span length out from assembly.*

*Calculations assume all conductors same size and type as largest conductor and level spans.*

*Assemblies have been multiplied by strength factor of 0.85 (2002 NESC Table 261-1A).*

*Applied loads have been multiplied by overload factors (2002 NESC Table 253-1).*

## Permitted Loads on Standard RUS Distribution Guy Assemblies

Recently RUS re-evaluated the ratings of the mechanical loading on standard RUS distribution guy assemblies. Following is a summary from that re-evaluation. Table 1 summarizes the new calculated "permitted loads" on standard RUS guy assemblies.

The RUS "designated capacities" (the strength to sustain longitudinal loads) of the component parts of standard guy assemblies are as follows:

| Guy Assembly Component | RUS Designated Capacity (lbs) | Notes |
|---|---|---|
| 2-1/4 inch square (flat) washer | 4,089 | (1) |
| 3-inch square, curved, washer | 7,766 | (1) |
| 4-inch square, curved, washer | 13,779 | (1) |
| 5/8 inch machine bolt | 8,300 | (2) |
| 3/4 inch machine bolt | 12,400 | (2) |
| Guy Attachments | | |
| Guy Hook type | 10,000 | (3) |
| Plate type | 10,000 | (3) |
| Wrapped type guy | 90% of RBS | (4) |
| Guy Strain Insulator | 10,000 | (3) |
| Guy Wire | 90% of RBS | (4) |

(1) The designated capacity equals area ($in^2$) of washer (less area of bolt hole) times allowed longitudinal loading on wood. RUS designates the allowable loading on wood to be 900 $lbs/in^2$ to avoid the crushing of wood fibers.

(2) Based on ANSI and manufacturers' rated shear strength.

(3) Based on RUS "Items Requirements" specifications and manufacturers' test results.

(4) RBS is the "Rated Breaking Strength" (of guy wire) as published by manufacturers. The 2002 Edition of the NESC requires that the RBS be multiplied by a strength factor of 0.90 found in Table 261-1A.

All of the guy assembly component parts tabulated above work in series in standard guy assemblies. The strength rating of a guy assembly is based on its component part with the lowest designated capacity.

RUS specifies that the designated capacity of each component part (excluding the guy wire) be multiplied by the following factors based on Table 2561-1A of the 2002 Edition of the NESC. The result of this multiplication yields the assembly's "permitted load" in pounds (lbs).

- 0.85 – NESC Grade C construction
- 0.65 – NESC Grade B construction

The following table compares the present strength ratings (in Bulletin 1728F-803) of standard RUS guy assemblies with their new calculated permitted loads. The "permitted loads" were calculated by multiplying the designated capacity of the assembly's component part with the lowest strength rating by a strength factor of 0.85.

**TABLE 1**

| **RUS Bulletin 1728F-803 - Specifications and Drawings for 24.9/14.4 kV Line Construction** | | | |
|---|---|---|---|
| **Assembly Number** | **Description** | **Maximum Working Load - Horizontal (lbs)** | **Permitted Load (lbs) (New)** |
| E1.1 | Single Down Guy (Through Bolt Type) | 5,200 | 3,475 |
| E1.01 | Single Overhead Guy (Through Bolt Type) | 5,200 | 3,475 |
| E1.02 | Single Overhead Guy (Through Bolt Type) | 8,500 | 6,600 |
| E2.1 | Single Down Guy – Heavy Duty (Through Bolt Type) | 8,500 | 8,500 |
| E3.1 | Single Down Guy (Wrapped Type) | 8,500 | 90 % of RBS or 14,000 |
| E4.1L | Single Down Guy – Large Conductors (Pole Band Type) | 10,000 | 10,000 |

- The tabulated values above should be reduced by 25 percent for NESC Grade B construction.
- Applied loads should never exceed 90 percent of the rated breaking strength of the guy wire installed.
- The tabulated "maximum working loads" are ratings for the horizontal direction; the "permitted loads" are not to be exceeded in any direction.
- Loads applied to guy assemblies need to be multiplied by the appropriate overload factor of Table 253-1 of the 2002 Edition of the NESC

The calculated "permitted loads" of the first three assemblies in the preceding table are based on the area of the washers used; the last three assemblies are based on the ratings of the guy attachment hardware.

There is an error in the material list for assembly "E1.1" in Bulletin 1728F-803. The guy attachment should be installed using a 3-inch, square, curved washer instead of a 2-1/4 inch square washer as listed. The permitted load for this assembly with a 3-inch, square, curved washer is 6,600 pounds.

If you would like more information or have any questions, please contact Jim Bohlk, Electrical Engineer, Distribution Branch, at 202-720-1967 or at jbohlk@rus.usda.gov.

## Guy Anchor Bonding Clamps

This past year, Rural Utilities Service (RUS) staff received an inquiry about anchor bonding clamps, Item **"ck"** in the RUS Information Publication IP 201-2, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers." The inquirer wanted to know whether these clamps were required by RUS and whether it was a National Electrical Safety Code (NESC) requirement.

As shown in the E type drawings included in RUS 15 and 25 kV overhead distribution construction specifications, RUS indeed **does require** the use of anchor bonding clamps on anchor assemblies.

The purpose of the anchor bonding clamp is to ensure the safety of the public and line crews. A properly installed anchor bonding clamp ensures there is a solid electrical connection between the anchor rod and the guy even during occasions when the guy in the anchor assembly goes slack.

On an anchor assembly with a slack guy that **does not** have an anchor bonding clamp installed, a person could come into contact with a guy wire that is solidly bonded to the neutral of the distribution system at the top of the pole and electrically is virtually disconnected from the anchor rod and anchor near where the person is standing. This could result in the person touching the guy wire and having direct contact to the electric system neutral and becoming exposed to a voltage that could be very different than the voltage of the earth the person is standing on. If the voltage difference is great enough, the person's body could become part of an electric circuit and draw an electric current that may result in anything from an unpleasant tingle to serious shock and injury.

On an anchor assembly with a slack guy that **does have** an anchor bonding clamp installed, a person will be standing on earth that is essentially at the same potential as the guy/anchor assembly because of the electrical contact existing between the solidly interconnected guy wire, anchor rod, anchor and soil. With little difference in potential between the earth and the anchor guy, little if any electric current will flow in the person's body minimizing the possibility of injury.

NESC Rule 215C2 requires that guys be effectively grounded. RUS specifications provide for this grounding assurance in part by requiring the guys to be bonded to the neutral at the top of the guy. On an ordinary tight guy, the effective grounding would be completed with the tight connection of the guy wire and anchor rod eye in contact with one another. However, as mentioned above, on an anchor assembly with a slack guy, this latter connection for assuring an effective bond between the anchor and guy is lost. RUS specifications require the guy anchor bonding clamp to make certain that the bond between the anchor and guy will remain effective in the event the guy becomes slack for whatever reason.

**Borrowers should be certain to check that guy anchor bonding clamps are used on all their anchor assemblies**.

If you would like more information or have any questions, please contact Jim Bohlk, Electrical Engineer, Distribution Branch, at 202-720-1967 or at jbohlk@rus.usda.gov.

## Preparing Complete Substation Plans and Specifications

Development of detailed, complete plans and specifications is essential to ensure substation construction and operation at the lowest possible cost commensurate with the quality of service desired.

The drawings accompanying the specifications should be of sufficient detail and accuracy to avoid any possible construction delay and/or errors/misinterpretations during the course of the project.

The following partial list of items needs to be considered when preparing substation drawings.

1. One-Line Diagram

   This drawing should be very closely reviewed since the general arrangement and ratings of all major electrical equipment are depicted on this drawing. Various items which should be included on the one-line diagram include:

   a. Current transformers, primary and secondary bus, regulators, breakers, and fuses are adequate for emergency loading.
   b. All spare current transformers shorted and grounded.
   c. Station service transformer fused.
   d. Relative location and ratings of surge arrestors to transformers and other critical equipment.
   e. North arrow included to orient the substation.
   f. Voltage, kVA, and current ratings included for all equipment.
   g. Overall relay protection scheme.
   h. All future and existing construction shown.
   i. Reflects physical arrangement of equipment.
   j. Adequate personnel protection via isolating and grounding switches, portable grounds, interlocks, etc.

2. Plot Plan

The orientation of the substation structures on the plot plan should be coordinated with the direction of the incoming and outgoing lines with all distances between adjacent structures and clearances properly dimensioned. Other items include:

a. Elevations of top of finished subgrade.

b. Access roads, culverts, and other drainage surfacing.

c. Fence and gate location.

d. North arrow.

e. Allowance for removal and installation of equipment and access for maintenance.

a. Sufficient space allowed for future expansion.

b. The entire area inside the fence and including a minimum of 3.3 feet outside the fence is covered with a minimum layer of 4-6 inches of gravel.

3. Elevations

The elevation drawings should detail all electrical equipment with special emphasis given to identifying critical clearances. These electrical clearances should be in accordance with RUS Bulletin 1724E-300, Table 4-7, with additional allowances made for heavy snow, high altitude, high contamination, and special problem areas. Other items include:

a. Rigid bus vibration dampers, usually conductor inside tubing bus.

b. Phase-to-ground clearances.

c. Minimum clearance of 8 feet 6 inches from grade level to the lowest external part of any insulator, bushing, or insulated housing.

d. Proper application of rigid bus expansion, slip or fixed joints.

e. Lightning masts, static wires, or bayonets.

f. Overhead groundwire shield angle less than 45 degrees and preferably 30 degrees.

g. Surge arrestor lead length short as possible.

h. Surge arrestors not used as bus supports.

i. Grounding provisions for disconnect switch handles.

j. Mobile substation connection provisions.

k. Proper length and BIL of suspension and post-type insulators.

4. Foundations

The drawings should include the type and design of the foundation and/or footings for the various substation structures. The drawings should be detailed enough to define the required construction as follows:

a. Steel reinforcement bar size, spacing, and location.

b. Top of concrete elevations.

c. Anchor bolt mark number, projection, and number required.

d. Number of foundations required for each type.

e. Depth of foundation in relation to frost line.

f. Cable trench

(1) Outline and reinforcement

(2) Gravel fill

(3) Cover

5. Grading

The grading drawings should show the plan and elevation of the finished subgrade and existing contours of the substation and surrounding area. These drawings should also give cross-sectional views indicating slopes for cut and fill areas, berms, access roads, and graveled surfaces. Reference to a north arrow and a horizontal tie should be shown on the plan. It is desirable for record purposes to show the location and log of the soil borings.

6. Grounding and Fence Details

The grounding calculations will be used to determine whether the overall substation ground grid will be of adequate size, length, and impedance to provide for proper operation of protective equipment as well as personnel safety. Improper grounding may produce such adverse effects as improper relay operation, transformer insulation failure, and possible serious injury to substation personnel. The following items are applicable:

a. Ground grid buried a minimum of 18 inches below grade.

b. Ground grid should extend a minimum of three feet outside the fence with the gate bypass extending a minimum of 1 foot 6 inches beyond the opened gate.

c. Ground conductor to be either copper, copper clad steel, or steel.

d. All below ground connections by exothermic weld process or compression type connections.

e. All above ground connections by bolted or compression connections.

f. Two or more ground paths for surge arrestors, transformers, and all other electrical equipment.

g. All structures connected to the ground grid.

h. Overhead ground wires terminated directly to the ground grid.

i. Adequate grounding conductor buried to allow for expansion and contraction during freeze/thaw cycles.

j. All runs of conduits and cable trays grounded to the grid.

k. All disconnect switch handles provided with grounding mats.

l. Chain link fence and gate grounded.

m. Transformer neutral bushing and surge arrestors connected directly to the grid.

n. Foundation reinforcing bars not used for grounding electrodes.

o. Fence minimum of 7 feet high with 1 foot barbed wire extension (recommended).

p. Adjoining metal fences not connected directly to substation fence.

7. Structural

Structural drawings should show the design loading requirements, manufacturing details, and erection of structure components, including embedded materials such as stub angles and anchor bolts.

Major structures used for transmission line take-off (deadend) and bus (strain) tower should be accompanied by a drawing indicating design conditions. This drawing serves as the criteria for the designer and a check to insure that the actual installation does not exceed design limits. The data shown on the drawings should include the following:

a. Basic geometry, height and beam dimensions.

b. Wind-ice design conditions.

c. Groundwire and conductor maximum tensions.

d. Horizontal and vertical spans and line angle.

e. Electrical equipment load.

f. Loading combinations.

Construction drawings for structure erection and stringing are needed to control and expedite construction activities at the site. Erection drawings should indicate the following:

a. Plan and elevation orientation of structure, referenced to north arrow.

b. Orientation of individual structure members.

c. Number, size, length, and torquing of field connection bolts.

d. Rake, camber orientation, and base plate grounding.

8. Station Service (AC)

Site and utility drawings should include all details of auxiliary substation equipment which will be installed. This should include details of AC and DC power panels, yard lighting, and wire sizing and the following items:

a. Transfer scheme provided for critical AC loads.

b. Cable sized for ultimate as well as present requirements.

c. Outdoor receptacles provided with ground fault interrupter (GFI) circuit breakers.

d. Adequate lighting over critical panel boards.

e. Minimum of 20 percent spare branch circuits.

f. Conduit fill not to exceed NEC requirements.

g. Cable will not exceed critical thermal limits under short-circuit.

9. Station Service (DC)

The DC system has the most critical loads. The drawing should include:

a. Alarm for loss of AC to battery charger.

b. Battery properly sized.

c. Battery room provided with eye wash facility and ventilator.

d. Positive leg of DC branch circuits should be fused.

The construction specifications must ensure that the materials and construction practices meet and comply with Rural Utilities Service (RUS) standards**,** recommended industry standards, and/or local requirements.

The following partial list of items needs to be considered in preparing substation specifications.

1. Site Work

a. Stripping and Clearing

(1) Disposal of spoil

(2) Saving of topsoil

(3) Borrow area

b. Grading

(1) Excavation

(2) Compacted fill

(1) Material - remove all organic materials

(2) Compaction requirements

(a) Granular - 70% relative density

(b) Cohesive - 90-95 % maximum dry density

(3) Drainage

c. Surfacing - 3/4 to 1-1/2 size gradation to a minimum of 4 inch depth

d. Soil Treatment - Weed control herbicide

2. Foundations

a. Excavation and Backfill

(1) Excavation

(2) Dewatering provisions

(3) Compaction of backfill around foundations

b. Cast-In Place Concrete

(1) Reference to ACI (American Concrete Institute) and ASTM International (formerly American Society for Testing and Materials) standards and specifications

(2) Cement

(a) Type I - General Construction

(b) Type II - Moderate sulfate soil

(3) Admixtures

(a) Air entrainment - if subject to freeze/thaw cycles

(b) Calcium chloride not advisable

(4) Hot and cold weather concreting requirements

(5) Quality control

(a) Field tests - slump, air content

(a) Laboratory tests - compression tests at 28 days

(6) Reinforcing steel

(7) Formwork

(8) Concrete finishes and curing

3. Substation Structures and Assemblies

   a. Material

      (1) Structural shape

      (2) Protective coating

         (a) Galvanizing

         (b) Weathering steel

         (c) Preservative (wood poles)

   b. Design-and Fabrication/Erection

      (1) Steel - General, American Institute of Steel Construction (AISC) "Steel Construction Manual"

         (a) Latticed - per American Society of Civil Engineers (ASCE) Manual No. 52

         (b) Tubular - per NEMA No. TT-1 or ASCE Preprint 2021 - "Design of Steel Transmission Pole Structures"

      (2) Aluminum - per ASCE Process Paper 9457, "Guide for the Design of Aluminum Transmission Towers"

      (3) Concrete - per IEEE Paper T75-170-6

      (4) Wood - per RUS Bulletins 1728F-700 and 1728H-701

4. Grounding

   a. All underground connections by exothermic weld process or pressure types

   b. All above-ground connections bolted

   c. Installation method and depth of ground rod

   d. At least two ground paths for all major electrical equipment

5. Fence

   a. Recommended minimum of 7 feet high in addition to a 1 foot barbed wire extension

   b. Minimum of 2 ounces of zinc (per ASTM A392) or .4 ounces of aluminum (per ASTM A491) per square foot of wire surface

6. Conduit

   a. Minimum bending radius not to exceed:

      (1) 12 times radius for shield cables

      (2) 6 to 8 times for non-shield cables

   b. Not to exceed NEC fill requirement

c. Aluminum conduit not to be buried in ground or embedded in concrete
d. No more than a total of 270 degrees in bends between accessible pull boxes
e. Proper grounding
f. Weep holes

7. Cable
   a. Proper protection of jacket and insulation during storage and installation
   b. Ends of cables sealed against absorption of moisture
   c. Direct burial cable with backfill of adequate thermal properties
   d. Suitable termination
   e. Shield adequately grounded
   f. Proper insulation for intended use

8. Bus
   a. Expansion, fixed and slip fittings
   b. Vibration control provisions
   c. Weep holes
   d. Proper precautions taken for aluminum-to-copper connections
   e. Welding procedures (i.e., inert gas shielding method preferred)
   f. Proper bolts for bus material being used
   g. Torque requirements
   h. Corona bells (above 161 kV)
   i. Adequately supported for bus forces

9. Instrumentation and Wiring
   a. Short type terminal block for CT circuit
   b. GFI breakers for outdoor receptacles
   c. Minimum of #14 AWG control wiring
   d. Proper tags and labels for all circuits

If you like more information or have any questions, please contact Mike Eskandary, Electrical Engineer, Transmission Branch, at 202-720-9098 or at meskanda@rus.usda.gov.

## An Alternative Approach to Constructing a Substation

There is an alternative approach to designing and constructing standard substations called the "Modular Substation" approach. Modular substations have been around for some time, but recently we have heard more news about this approach. One reason for this is that the modular substation approach makes it more cost effective and more appealing now when compared with traditional substation construction. Recent improvements in substation equipment technology and cost efficiencies in installation and energizing of a modular substation make it more popular than a traditional substation. Some utilities have benefited from the short time commissioning and flexibility that the modular substation approach offers in site selection.

A typical modular substation consists of pre-assembled equipment installed on steel framing, pre-wired and tested before delivery to the site. The module then would be installed on the customer's pier foundations. This approach has resulted in significant savings on site work, construction and commissioning time. Completion time for a modular substation usually is half of the time that is required to complete traditional substation construction.

Modular substation design uses a broad range of applications and provides installation flexibility, allowing it to be tailored to the utility's requirements and commissioned within a short time frame. The modular substation is an ideal solution for additions or replacement of existing substation.

Many of industry's leaders in the substation business are now providing modular substation fabrication and installations.

Please consult with your General Field Representative to discuss special modular substation bidding and contracting.

If you would like more information or have any questions, please contact Theodore V. Pejman, Electrical Engineer, Transmission Branch, at 202-720-0999 or at tpejman@rus.usda.gov.

# OPERATIONS

## Rural Electric Safety Accreditation Program

The Rural Electric Safety Accreditation Program (RESAP), administered by the National Rural Electric Cooperative Association (NRECA), is a peer-review safety and loss control evaluation of electric utilities. It is an organized analysis of a system's safety and loss control program that measures overall effectiveness.

This unique program began in 1967, and has developed over the years into a tool to assist electric utility management in its role and commitment to achieve and maintain high safety standards for the protection of its employees and the community served. There are presently 437

accredited systems, including one municipal system. Although the focus of the program is towards cooperatives, any electric utility may apply for accreditation.

RESAP, which falls under the Education, Research, and Technology Committee of NRECA, is overseen by a group of delegates, including representatives from the National Utility Training and Safety Education Association, NRECA, the insurance industry, and the Rural Utilities Service (RUS). The present delegates include managers of electric distribution cooperatives, as well as a board member from another electric distribution cooperative.

RESAP delegates are assisted in the accreditation process by 35 area administrators who administer the program locally and oversee field observations. The area administrators assist and coach the electric systems in the preparation of their safety accreditation applications. In many cases the area administrator is the safety director of the statewide cooperative association.

Accreditation is valid for three years. The accreditation process consists of:

- The applicant preparing an application that represents a collaborative record of the applicant electric system's safety policies and procedures over the past three calendar years;

- The appropriate RESAP area administrator coordinating an onsite field observation of the applicant's system for the purpose of evaluating the physical aspects of the system; and,

- The applicant submitting the application and observation forms to the Rural Electric Safety Accreditation Committee for review.

In order to become accredited, a system must have an average score (observation and application) of at least 70. Each scoring element is graded between 0 and 5, with 3 being average. There are 161 scoring elements in the on-site observation and 83 elements in the application. A system that scores average on everything will not be accredited. Accreditation is for the above average system; however, most of the items in the guidelines are just good practice. For example:

- Does the system have a written safety or loss control policy?

- Is the responsibility for the program assigned to the general manager?

- How often is pole-top rescue training conducted?

- What percentage of employees has had first aid and CPR training?

- Are job briefings conducted prior to start of work?

- Are employees trained in hazard recognition?

- Does the system distribute printed safety material or conduct community education programs?

- Are the vehicles properly maintained?

As you can see, safety accreditation looks at many areas of a system's operations. However, foremost is management's role and commitment to achieve and maintain high safety standards for the protection of its employees and the community served.

For information on the safety accreditation program, please contact Ken Brubaker of NRECA at 703-907-6414 or at ken.brubaker@nreca.org, or Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at 202-720-0980 or at hbowles@rus.usda.gov.

## Southern Pine Beetle Infestation

There have been numerous reports from cooperatives in the Southeast detailing massive damage as the result of the infestation of the Southern Pine Beetle (SPB). The majority of the damage consists of power outages and potential personal injury due to falling limbs and trees.

The SPB is one of the most destructive pests of pines in the southern United States. This insect killed approximately 4.5 million board feet of pine timber from 1973 through 1977 in the southern US. It attacks and can kill all species of pine, but prefers loblolly and shortleaf. Major outbreaks usually last 3 to 5 years and occur in irregular cycles of 7 to 10 years.

The U.S. Forest Service and the respective state Departments of Forestry have participated in remedial efforts to provide for safer and less disruptive conditions for the public and businesses.

RUS may be able to help by providing financial assistance to borrowers for a portion of the power line right-of-way clean-up work. In situations where there are a vast number of trees with a high probability of falling, utilities have learned that in addition to clearing the immediate right-of-way, the most prudent solution is to widen the existing right-of-way sufficiently to assure that the remaining trees cannot reach the conductors, should they eventually fall. RUS will consider approval of loans to all affected borrowers to widen current rights-of-way to take potential tree problems out of the picture. This financing assistance would be for costs of cutting and clearing on each side of existing rights-of-way for specified distances designated by the borrower as sufficient to assure that trees will not fall into conductors. The cutting and clearing of the existing right-of-way would be treated as maintenance work and be financed by the borrower. If borrowers would like to consider pursuing RUS financing of right-of-way clearing, please contact your RUS General Field Representative.

If you would like more information or have any questions, please contact Bob Lash, Chief, Transmission Branch, at 202-720-0486 or at blash@rus.usda.gov.

# ENVIRONMENTAL

## Final Spill Prevention, Control, and Countermeasure Plan Regulations Issued

The following information was published in the National Rural Electric Cooperative Association's (NRECA's) Environmental Bulletin dated August 2, 2002. The Environmental Protection Agency (EPA) published the final Spill Prevention, Control and Countermeasure Plan (SPCC) rule in the Federal Register on July 17, 2002 at 67 FR 47042. The full name of the rule is "Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities." While there was some doubt under the old rules, oil filled electrical equipment at many substations is now clearly within the scope of the new SPCC rule. Under the old rules a plan was needed only if a spill could reasonably reach navigable waters. Now, a plan is needed if it could affect "natural resources" (very broadly defined). Reaching navigable waters is a secondary concern.

With very limited exceptions, **electric utilities and co-ops that do not currently have SPCC plans for oil filled equipment like transformers, capacitors and underground cable systems at substations and at other locations will have to develop plans by February 17, 2003 and implement the plans by August 13, 2003.** This will be a challenge when a large number of substations are involved.

EPA included some features into the new rule, however, to make this job a little easier. For example, while "secondary containment" is required to ensure that spilled oil does not get off site, the agency included on-site "sorbent material" as an example of secondary containment - Section 112.7(c). Also, system wide plans are allowed. The plans must, however, specifically identify individual facilities - Section 112.7.

If your facility has less than a total of 1320 gallons of oil, a plan is not needed. Also, by carefully defining "facility," it may be possible to limit the number of plans required - Section 112.2. You can get a time extension if the "nonavailablity of qualified personnel" affects your ability to develop a plan - Section 112.3(f). If you determine that installation of secondary containment is "not feasible" it may be permissible to have a written commitment of manpower, equipment and materials instead - Section 112.7(d).

A copy of the regulations is posted at: http://www.usda.gov/rus/electric/engineer.htm and at http://www.cooperative.com. A short summary is available at the latter site. NRECA is currently working on a more detailed summary of the new regulations which will be posted at http://www.cooperative.com as soon as it is available. NRECA is also working with other organizations to set up a number of workshops around the country where EPA headquarters and regional staff will be invited to discuss the new rules with affected companies.

If you would like more information or have any questions, please call Jim Stine, Sr., NRECA, Environmental Manager (Water & Solid Waste Issues) at 703-907-5739 or at james.stine@nreca.org; Dennis Rankin, Environmental Protection Specialist, Engineering and

Environmental Staff, at 202-720-1953 or at drankin@rus.usda.gov; or Mike Eskandary, Electrical Engineer, Transmission Branch, at 202-720-9098 or at meskanda@rus.usda.gov.

## RUS Raptor Protection Guide Drawings

Raptor electrocution continues to be one of the major wildlife concerns of the U.S. Fish and Wildlife Service (USFWS), especially in states west of the Mississippi River. However, raptor electrocutions/collisions reporting is increasing in the eastern United States. Raptors (birds of prey) are a group of birds, which includes eagles, falcons, owls, kites, hawks, osprey and vultures. These birds of prey are protected through several laws, which include the Endangered Species Act, the Eagle Protection Act and the Migratory Bird Treaty Act. Violations of these laws can result in fines and/or imprisonment. Disturbed by the continuing large numbers of raptors, particularly eagles, electrocuted along power lines, the USFWS is continuing to step up enforcement of these laws.

RUS has been receiving requests for guide drawings for raptor electrocution prevention measures/designs for standard RUS distribution structures. In accordance with 7 CFR 1724.52 of the Code of Federal Regulations, borrowers are permitted to use structures designed for raptor protection that are in accordance with *Suggested Practices for Raptor Protection on Power Lines – The State of the Art in 1996*, [hereafter called the "*Suggested Practices*"], published by the Edison Electric Institute/Raptor Research Foundation. Such structures must be in accordance with the National Electrical Safety Code unless a specific waiver has been granted by the authority having jurisdiction in the area where the structure is located.

Any deviation from the RUS construction standards for the purpose of raptor protection which is not in accordance with *Suggested Practices* must be approved by RUS prior to construction.

*Suggested Practices* advocates the following measures to curtail raptor electrocutions on distribution pole top structures:

(A) A minimum of 60 inch horizontal and 12 inch vertical separation of conductors;

(B) The use of covered/insulated coverings over bare conductors at structures;

(C) The construction of perches or perch guards; or,

(D) The use of armless construction or undergrounding lines when the above measures are not feasible.

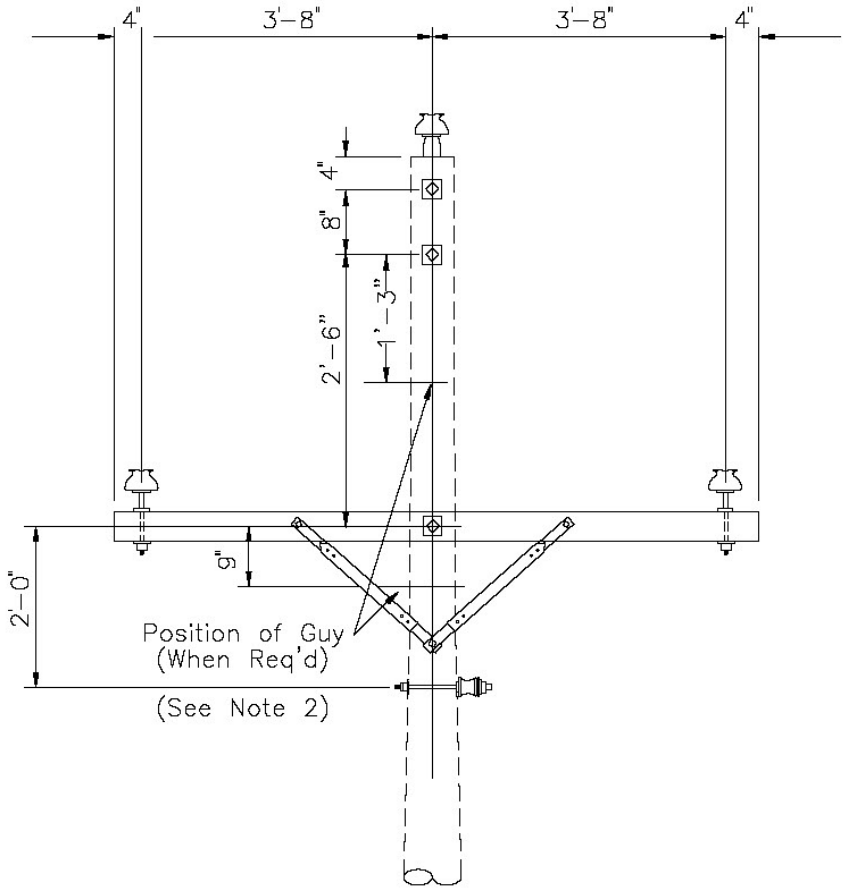
*Suggested Practices* states that "95 percent of all eagle electrocutions could be eliminated by correcting 2 percent of all the poles". Of particular concern are "preferred poles," which are poles frequently used by eagles as perches for hunting. These poles, more than any others, need to be identified and modified to be made raptor safe.

Standard raptor protection drawings are currently being incorporated in RUS Bulletins 1728F-803 and 1728F-804, "Specifications and Drawings for 24.9/14.4 kV Line

Construction," and "Specifications and Drawings for 14.4/12.45 kV Line Construction," respectively, which are now under revision. The recommended drawings to be included in these revised documents are shown on attached Figures 1 through 5. It is noted that the materials used for these modified assemblies are virtually the same as the corresponding standard assemblies. The choice of which modification to employ is an economic decision, based on such factors as ground clearances, age of facilities, and cost of materials and labor.

Installing distribution lines underground for the purpose of raptor protection is an economic decision that must be studied and justified by the borrower. The use of armless construction, which may be more costly and less reliable than RUS' preferred standard crossarm construction, is discouraged. However, RUS will consider the use of armless construction in certain situations on a case-by-case approval basis.

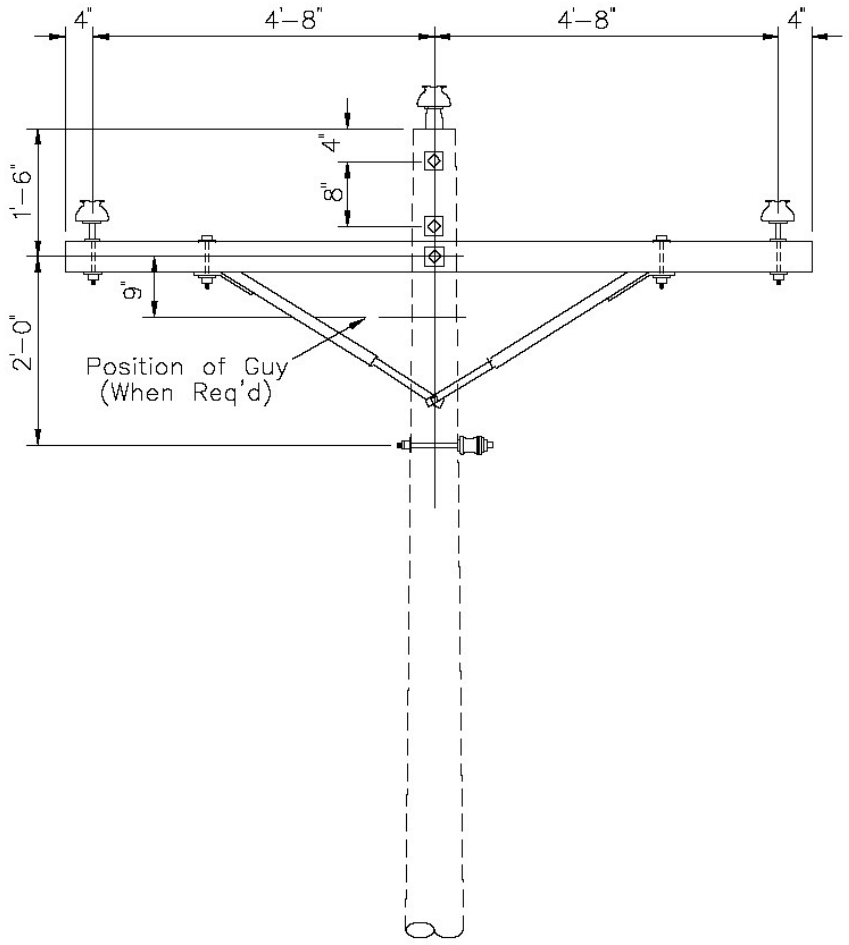
If you would like more information or have any questions, please contact Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff, at 202-720-1953 or at drankin@rus.usda.gov.




NOTES:

1. See "C1" and "C2" drawings for additional construction details and materials.
2. All down guys must be insulated at top of pole.

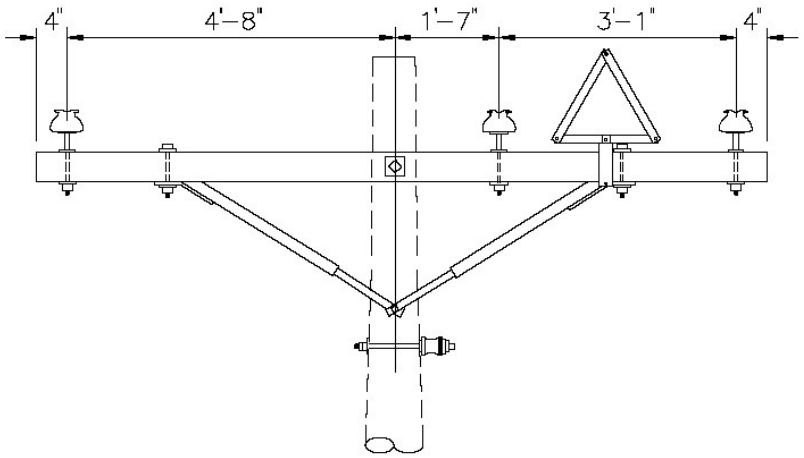
| DESIGN PARAMETERS: | RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 8 FOOT CROSSARMS (TANGENT) | | |
|---|---|---|---|
| | . RUS | 3 – PHASE PRIMARY 12.47/7.2 kV | FIGURE 1 |

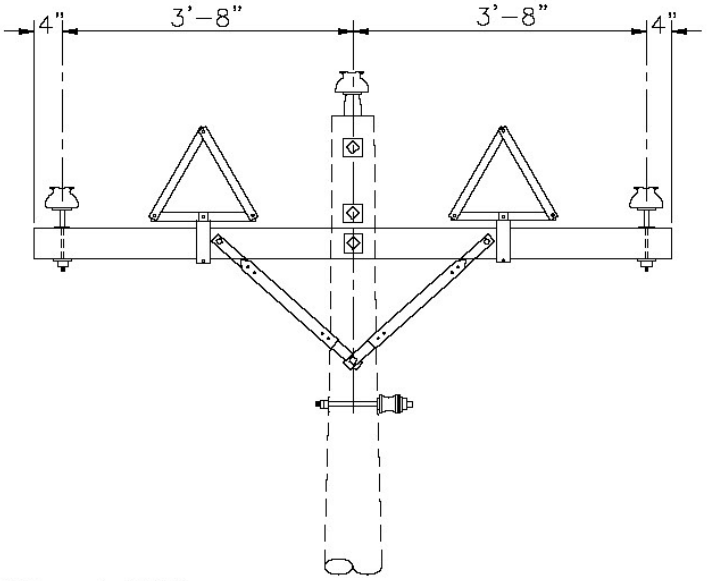



NOTE:

1. See "C1" and "C2" drawings for additional construction details and materials.

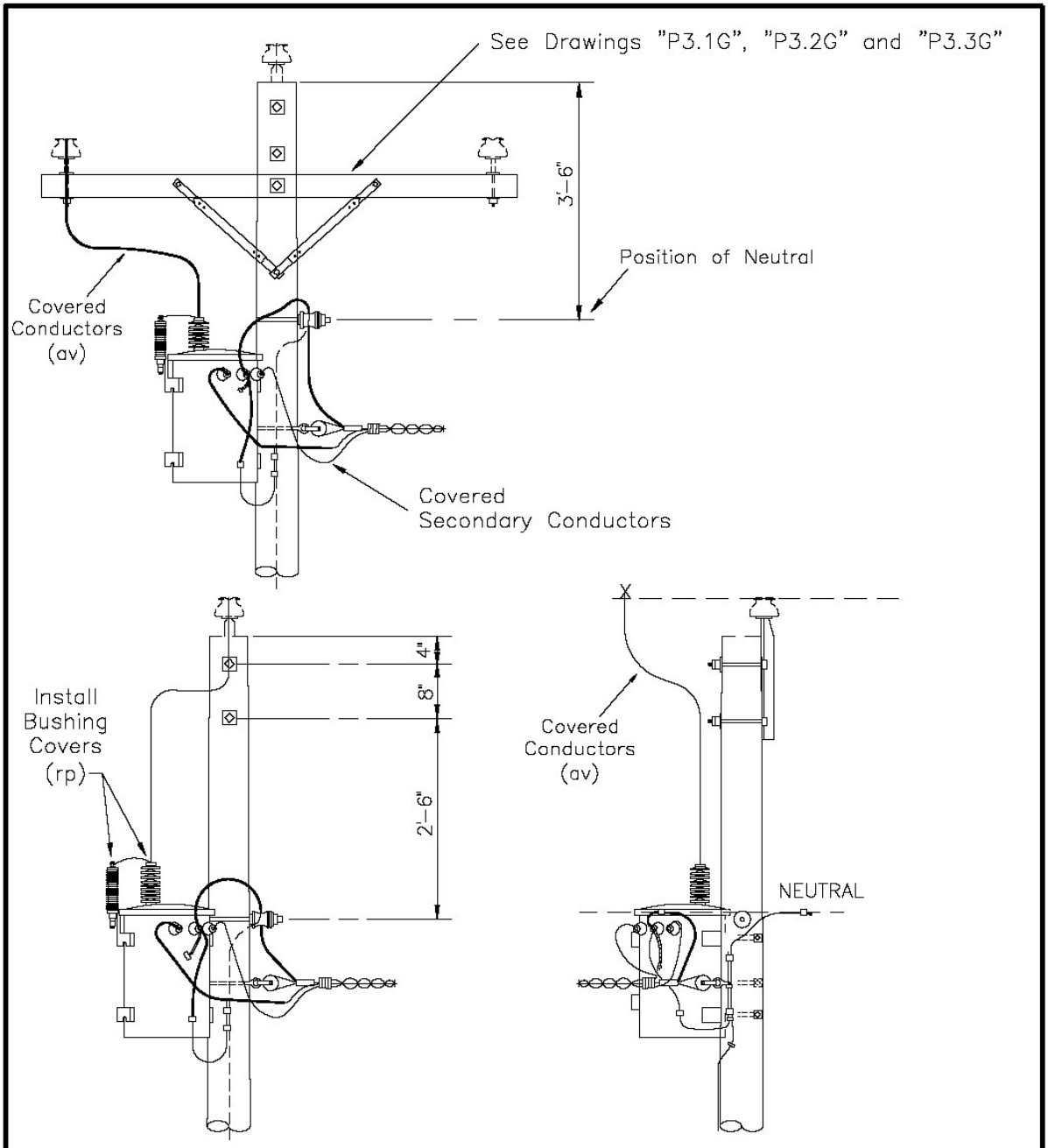
| DESIGN PARAMETERS: | RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 10 FOOT CROSSARMS (TANGENT) | | |
|---|---|---|---|
| | APR 2002<br>RUS | 3 – PHASE PRIMARY<br>12.47/7.2 kV | FIGURE 2 |

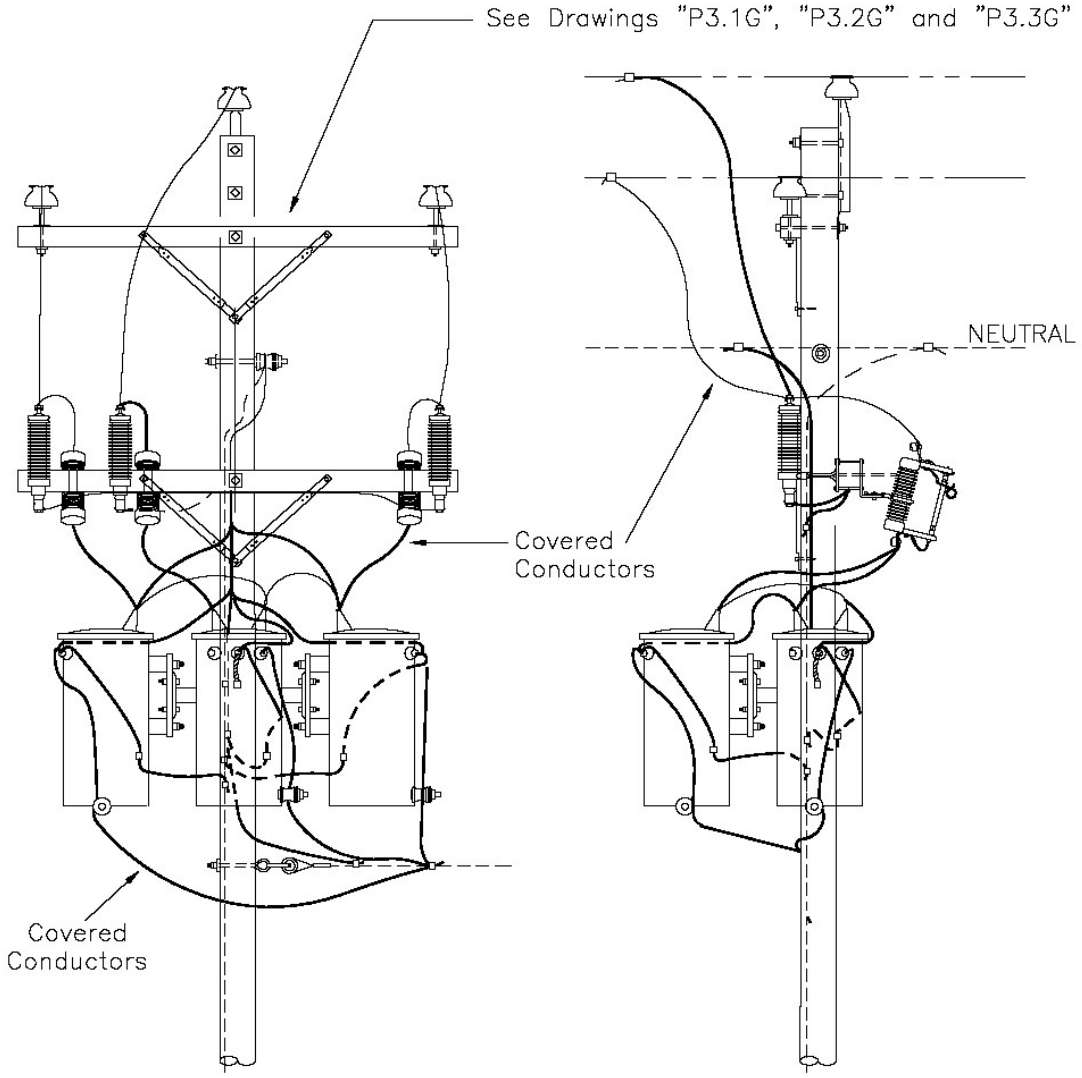



NOTE:
1. See "C1", "C2", and "C3" drawings for additional construction details and materials.

| DESIGN PARAMETERS: | RAPTOR PROTECTION<br>PERCH GUARDS–GUIDE | |
|---|---|---|
| | MAY 2002<br>RUS | 3–PHASE PRIMARY<br>12.47/7.2 kV |
| | | FIGURE 3 |


See Drawings "P3.1G", "P3.2G" and "P3.3G"
3'-6"
Position of Neutral
Covered
Conductors
(av)
Covered
Secondary Conductors
4"
8"
2'-6"
Install
Bushing
Covers
(rp)
Covered
Conductors
(av)
NEUTRAL
Note: Specify Insulated Transformer Covers (Lids);
Minimum Dielectric Strength=15kV
DESIGN PARAMETERS:
See Guide Drawing "G1.2"
RAPTOR PROTECTION
SINGLE-PHASE, CSP TRANSFORMER
(TANGENT POLE)
May 1, 2001
RUS
12.47/7.2 kV
FIGURE 4




Notes: 1. Specify Insulated Transformer covers (lids); Minimum Dielectric Strength 15kV
2. Install bushing covers (rp) on all surge arresters and transformer bushings.

| DESIGN PARAMETERS: | RAPTOR PROTECTION ASSEMBLY GUIDE THREE–PHASE TRANSFORMER BANK | | |
|---|---|---|---|
| See Guide Drawing "G3.3" | JUNE 2002 | 3 – PHASE PRIMARY | |
| | RUS | 12.47/7.2 kV | FIGURE 5 |

## Raptor Electrocution/Collision Prevention Information

Several publications/videos concerning raptor electrocution prevention, bird collision mitigation and animal caused outages are available. These publications include:

- Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices For Raptor Protection On Power Lines: The State of the Art in 1996. Edison Electric Institute/Raptor Research Foundation. Washington, D.C. (Available from the Raptor Research Foundation, Jim Fitzpatrick, Director, Carpenter St. Croix Valley Nature Center, 12805 St. Croix Trail, Hastings, MN 55033. Cost is $30.00 plus $5.00 postage and handling.)

- Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions With Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C. (Available from the Edison Electric Institute, 701 Pennsylvania Avenue, NW, Washington, D.C. 2004-2696. Cost is $40.00 plus $6.50 handling for non-members and $32.00 plus $6.50 handling for members.)

- The Avian Power Line Interaction Committee (APLIC) has also developed two videos, which complement the above publications. These videos are available through the Edison Electric Institute.

- Raptors At Risk Video. (Available from EDM International, Inc., 4001 Automation Way, Fort Collins, CO 80525-3479 Telephone: (970) 204-4001/Fax: (970) 204-4007. Cost is $12.00 for production, shipping and handling. Checks should be made payable to EDM International, Inc.

If you would like more information or have any questions, please contact Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at 202-720-1953 or at drankin@rus.usda.gov; Richard Harness of EDM International, at 970-204-4001 or at rharness@edmlink.com; or John Bridges, Western Area Power Administration, at 720-962-7255 or at bridges@wapa.gov.

## U.S. Fish and Wildlife Service Memorandums of Understanding

Raptors and other migratory birds are protected by several Federal laws, including the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act, and the Endangered Species Act. The MBTA is a strict liability law which means that the U.S. Fish and Wildlife Service (USFWS) only has to show that the birds were killed by the activities of an individual or business. It does not require the USFWS to prove that there was intent to kill or take a bird, only that a bird was killed or taken. The only birds not protected by MBTA include the English sparrow, the starling and the pigeon. In order to further its goal of eliminating/minimizing bird mortality, the USFWS is promoting and developing a Memorandum of Understanding (MOU) that will partner the USFWS and utilities into protecting migratory birds.

The MOU is a pro-active approach to protect raptors and other migratory birds and eliminate/minimize unlawful deaths. It establishes a written policy for bird protection and procedures to follow by utility personnel. The MOU should eliminate enforcement actions against MOU signatories in the future for an unforeseeable take. An MOU usually has provisions for a system wide assessment, the establishment of an avian protection plan, procedures for reporting/retrieving dead and injured birds, procedures for nest removal from utility structures, and requirements for record keeping. The MOU should be signed by the utility, the USFWS, and the state fish and game department.

MOU's are currently being developed in Colorado, Montana, North Dakota, Kansas, and New Mexico. In addition, several individual utilities around the country have been asked to sign an MOU. Xcel Energy was recently the first utility to sign an MOU with the USFWS. It is expected that the USFWS will pursue agreements with all utilities in the United States.

If you would like more information or have any questions, please contact Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff, at 202-720-1953 or at drankin@rus.usda.gov.

## Avian Power Line Interaction Committee

The Avian Power Line Interaction Committee (APLIC) was formed in the late 1980s to deal with crane collisions with power lines in southern Colorado. It was originally composed of ten utilities nationwide, the Edison Electric Institute (EEI), the U.S. Fish and Wildlife Service (USFWS) and the Audubon Society. Today it includes 20 utilities, EEI, USFWS, and Hawkwatch International. The National Rural Electric Cooperative Association has recently become an APLIC member.

APLIC is a leader in the electric utility industry in the protection of avian resources while enhancing energy delivery. It works in partnership with utilities, resource agencies and the public to:

- Develop and provide educational resources
- Identify and fund research
- Develop and provide cost-effective management options
- Serve as a focal point for avian interaction utility issues

APLIC meets twice a year and deals with avian interactions with utility structures to include electrocution and collision issues. APLIC has produced:

- Training videos
- State-of-the art manuals on bird collisions and raptor electrocutions
- Short course on collision and electrocution issues
- Other educational materials

It also funds various research projects. Current APLIC activities include:

- Research
- Web site development
- Spanish translation of raptor protection manual
- Short courses
- Guidance and advice to other utilities

APLIC is currently working with USFWS on a template for Memorandum of Understandings and Avian Protection Plans and an update/revision of *Suggested Practices For Raptor Protection On Power Lines: The State Of The Art In 1996*.

If you would like more information or have any questions, please contact Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at 202-720-1953 or at drankin@rus.usda.gov, Rick Loughery, EEI, at 202-508-5647, or Jim Burruss, APLIC, at 801-220-2535.

## U.S. Fish and Wildlife Service Interim Guidelines for Recommendations on Communications Tower Siting, Construction, Operation and Decommissioning

Because of the increasing number of communications towers being constructed in the United States, the U.S. Fish and Wildlife Service (USFWS) is concerned with avian mortality due to bird collisions. Albert Manville of the USFWS has stated that "approximately 350 species of neotropical songbirds appear to be the most susceptible to collisions with communications towers." These birds are protected by the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703 et seq.). These guidelines were prepared to assist USFWS in meeting its obligations under the Migratory Bird Treaty Act. Applicants and consultants planning communications tower projects are asked to review these guidelines and determine whether their project has incorporated any of the recommendations. While adopting the recommendations into a project design is voluntary, the recommendations are designed to minimize the risk of communications towers to birds that are protected by the Migratory Bird Treaty Act.

In order to obtain information on the usefulness of these guidelines in preventing bird strikes, and to identify any recurring problems with their implementation which may necessitate modifications, RUS would appreciate it if borrowers would please advise us of the final location, specifications of the tower, which of the measures recommended for the protection of migratory birds were implemented, and the details of the problems encountered and the solutions, if any, that the borrower incorporated. If any of the recommended measures could not be implemented, please explain why they were not feasible so we can identify work to make the guidelines more useful.

## Tower Guidelines

1. Any company/applicant/licensee proposing to construct a new communications tower should be strongly encouraged to co-locate the communications equipment on an existing communication tower or other structure (e.g., billboard, water tower, or building mount). Depending on tower load factors, from 6 to 10 providers may co-locate on an existing tower.

2. If co-location is not feasible and a new tower or towers are to be constructed, communications service providers should be strongly encouraged to construct towers no more than 199 feet above ground level (AGL), using construction techniques which do not require guy wires (e.g., use a lattice structure, self-supporting steel structure, etc.). Such towers should be unlighted if Federal Aviation Administration (FAA) regulations permit.

3. If constructing multiple towers, providers should consider the cumulative impacts of all of those towers to migratory birds and threatened and endangered species as well as the impacts of each individual tower.

4. If at all possible, new towers should be sited within existing "antenna farms" (clusters of towers). Towers should not be sited in or near wetlands, other known bird concentration areas (e.g., State or Federal refuges, staging areas, and rookeries) in known migratory or daily movement flyways, or in habitat of threatened or endangered species. Towers should not be sited in areas with a high incidence of fog, mist, and low ceilings.

5. If taller towers (greater than 199 feet AGL) requiring lights for aviation safety must be constructed, the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA should be used. Unless otherwise required by the FAA, only white (preferable) or red strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. The use of solid red or pulsating red warning lights at night should be avoided. Current research indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights. Red strobe lights have not yet been studied.

6. Tower designs using guy wires for support which are proposed to be located in known raptor or waterbird concentration areas or daily movement routes, or in major diurnal migratory bird movement routes or stopover sites, should have daytime visual markers on the wires to prevent collisions by these diurnally moving species. (For guidance on markers, see *Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*. Edison Electric Institute, Washington, D. C., 78 pp., and Avian Power Line Interaction Committee (APLIC). 1996. *Suggested Practices for Raptor Protection on Power Lines.* Edison Electric Institute/Raptor Research Foundation, Washington, D. C., 128 pp. Copies can be obtained via the Internet at http://www.eei.org/resources/pubcat/enviro/, or by calling 1-800-334-5453).

7. Towers and appendant facilities should be sited, designed and constructed so as to avoid or minimize habitat loss within and adjacent to the tower "footprint." However, a larger tower footprint is preferable to the use of guy wires in construction. Road access and fencing

should be minimized to reduce or prevent habitat fragmentation and disturbance, and to reduce above ground obstacles to birds in flight.

8. If significant numbers of breeding, feeding, or roosting birds are known to habitually use the proposed tower construction area, relocation to an alternative site should be recommended. If this is not an option, seasonal restrictions on construction may be advisable in order to avoid disturbance during periods of high bird activity.

9. In order to reduce the number of towers needed in the future, providers should be encouraged to design new towers structurally and electrically to accommodate the applicant/licensee's antennas and comparable antennas for at least two additional users (minimum of three users for each tower structure), unless this design would require the addition of lights or guy wires to an otherwise unlighted and/or unguyed tower.

10. Security lighting for on-ground facilities and equipment should be down-shielded to keep light within the boundaries of the site.

11. If a tower is constructed or proposed for construction, service personnel or researchers from the Communications Tower Working Group should be allowed access to the site to evaluate bird use, conduct dead-bird searches, to place net catchments below the towers but above the ground, and to place radar, Global Positioning System, infrared, thermal imagery, and acoustical monitoring equipment as necessary to assess and verify bird movements and to gain information on the impacts of various tower sizes, configurations, and lighting systems.

12. Towers no longer in use or determined to be obsolete should be removed within twelve (12) months of cessation of use.

If you would like more information or have any questions, please contact Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at 202-720-1953 or at drankin@rus.usda.gov.

# MATERIALS

## Technical Standards Committee “A” (Electric)

With more than 60 years of experience, the Rural Utilities Service (RUS) has found that electric utility construction, operation, and maintenance are best when high-quality, long-lasting materials are used. Because the quality of materials is so important to program objectives, RUS continues to require that borrowers observe RUS standards and use Technical Standards Committee “A” (Electric) (TSC “A”) accepted products on their systems whether they use RUS loan funds, other sources of financing assistance, or their own general funds.

What Is TSC "A"?

TSC "A" is an RUS Electric Program committee which: (1) Accepts manufacturers' products as satisfactory for use on RUS borrowers' facilities, and (2) Approves all RUS Electric Program standards and specifications, including RUS construction drawings, and RUS technical bulletins and Informational Publications.

Membership

TSC "A" consists of five RUS engineers: two from the RUS Regional Division Engineering branches, two from the Electric Staff Division (ESD), and a permanent committee chair. Collectively, these members are subject matter experts in distribution and transmission engineering standards, specifications, design, and electric utility construction contracting procedures.

RUS Product Acceptances

TSC "A" considers requests from manufacturers and makes determinations as to whether the products comply with applicable RUS and national industry standards and specifications and can be expected to perform satisfactorily in the harsh environments of rural America. TSC "A" limits its acceptance to one product per manufacturer for a specific category of product; this limitation allows manufacturers to concentrate on one design for rural electric borrowers, enabling the manufacturers to pass the efficiencies of standardization on to their customers.

RUS List of Materials

For borrower convenience purposes, materials and equipment accepted by TSC "A" that meet the RUS domestic origin provisions are included in RUS Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers." (Domestic origin means manufactured in the United States or any eligible country substantially all from materials or supplies mined, produced, or manufactured in the United States or any eligible country. Eligible countries are determined by the Office of the U.S. Trade Representative.) The List of Materials is published in a subscription format with the full base issue printed each July followed by supplements every October, January, and April. RUS borrowers receive one subscription free of charge each year. Additional copies are available from the U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954, telephone 202-512-1800.

Types of RUS Acceptances

TSC "A" considers three types of acceptances:

- FULL ACCEPTANCE - Domestic origin products for which no restrictions are placed on use and included in the List of Materials;

- CONDITIONAL ACCEPTANCE - Domestic products for which RUS has limited experience. Acceptance conditions are noted on acceptance letter to manufacturer

and in RUS' List of Materials. Contractors also need to obtain borrowers' approvals before supplying conditionally accepted items on each project; and,

- TECHNICAL ACCEPTANCE - Non-domestic origin products of the same category types as RUS accepted domestic origin products. Technically accepted products: a) may have conditions, b) are limited to a 1-year acceptance after which yearly renewal is considered, and c) are not included in the List of Materials. Technical acceptance letter issued indicates any conditions and date of technical acceptance expiration. Contractors need borrowers' approvals to supply technically accepted items on each project.

Accepted Product Categories

TSC "A" determines the categories of products for which RUS acceptance is considered. TSC "A" does not grant acceptance for every type of product used by RUS borrowers. Instead, TSC "A" considers only categories of products central to electric transmission and distribution systems for which fairly significant use by borrowers is expected, e.g., air break switches, anchor rods, transformers, etc. Acceptance is not considered nor is it needed for office equipment, tools and work equipment, items of electric general plant, consumer-owned wiring facilities, etc. Borrowers are expected to use their own best judgment when procuring such items and assess the conformance of such products with applicable national industry standards, codes, and applicability of the product for the need. Categories are added and eliminated as conditions of borrower use and technology dictate.

Product Acceptance Procedure

The manufacturer of a product that falls within a product acceptance category desiring RUS acceptance needs to submit a letter of request to:

Technical Standards Committee "A" (Electric)
Rural Utilities Service
STOP 1569
1400 Independence Ave, SW
Washington, DC 20250-1569

The manufacturer needs to include the following with each request:

- Description of each product, including specific catalog number and the RUS item category for which RUS acceptance is requested;

- Drawings or catalog sheets detailing dimensions, materials, etc.;

- Recent certified test data detailing compliance of the product with appropriate standards, specifications, etc.;

- A sample of each product for most items (the TSC "A" chair should be contacted prior to submitting any samples); and

- If seeking domestic product acceptance, a statement of origin that reads as follows:

- "[Identify here each product to be considered by catalog number] is manufactured in the United States or any eligible country substantially all from articles, materials or supplies mined, produced or manufactured in the United States or any eligible country."

All written and printed material has to be submitted in six copies (original and five copies). Requests need to be signed by an authorized representative of the manufacturer. RUS does permit agents to assist with certain administrative matters but applications have to include an original signature of the manufacturer.

The Electric Staff Division was recently contacted concerning a manufacturer having both an acceptance for a product and a technical acceptance for the same product. In order to promote fairness to manufacturers, while protecting the interests of our borrowers, the following guidelines were developed for use when a manufacturer desires both acceptance (or conditional acceptance) and technical acceptance for the same product. We are concerned that a borrower may not be able to easily determine the country of origin when purchasing products, especially when not purchased directly from the manufacturer, and thus not be able to properly apply the six percent price differential discussed in Bulletin 43-9, "Buy American" Requirement.

The manufacturer must:

- Certify that the products are identical in all respects, except for the manufacturer's identification mark,

- Certify that the warranty is the same for both products,

- Provide a different catalog number for the technically accepted product,

- For items, such as bolts and wire cable products, for which catalog numbers are not shown in the List of Materials, the manufacturer must provide catalog numbers for both the accepted item and item submitted for technical acceptance,

- Use a different manufacturer's identification mark for the technically accepted product, and

- Provide assurance that prospective purchasers will be advised as to which product will be furnished prior to purchase, including products sold through distributors or jobbers.

RUS Application Review

Personnel in ESD are assigned to review applications and prepare reports to TSC "A." The ESD reviewer will contact the manufacturer if any additional information is needed in order to prepare a report to TSC "A".

The manufacturer's application and the product's corresponding RUS staff report are presented to TSC "A" for acceptance consideration. Following discussions of the application, TSC "A"

may act to: (1) grant any of the three types of acceptance described previously, (2) table consideration until receipt of any additional information TSC "A" deems necessary to make a determination, or (3) reject the request. The Chair will provide the manufacturer with written notice of the Committee's decision.

Appeal Process

Manufacturers may appeal any adverse TSC "A" decisions by writing to Technical Standards Committee "B" (Electric) at Rural Utilities Service, 1400 Independence Ave SW, STOP 1569, Washington, DC 20250-1569. This Committee consists of the directors of the Northern and Southern Regional Divisions and the director of the Electric Staff Division.

Additional Information

For additional information about the acceptance process or specific requirements for a particular product, please contact Harvey Bowles, Chair, Technical Standards Committee "A" (Electric) at 202-720-0980, or at hbowles@rus.usda.gov.

## Chromated Copper Arsenate

On February 12, 2002, chemical manufacturers and EPA agreed to a two-year phase-out of the wood preservative chromated copper arsenate (CCA) for residential uses such as decks, fences and playgrounds. The manufacturers have each decided to seek to amend their respective registrations with EPA for CCA for specific uses. The agreement with EPA does not affect production of treated wood used for industrial and commercial purpose such as utility poles, piling, or highway construction.

The phase-out period begins immediately and ends December 31, 2003. By that date, the production of CCA treated wood for residential purposes must be halted. Existing stocks of CCA treated lumber covered by the agreement may still be sold to the public after that date until stocks are depleted. In announcing the agreement, EPA made it clear that there "is no conclusive evidence that CCA treated wood poses unreasonable risks to the public." EPA also said that there was no reason to replace or remove existing CCA-treated structures.

Given that CCA is used by a substantial number of rural electric systems, there have been several questions asked about disposal issues and whether they were affected by this agreement. The agreement did not address any such issues. Cooperatives must still exercise prudent judgment when deciding how to dispose of any used poles or crossarms. Many systems use both liability waivers and CIS (Consumer Information Sheets) when giving or selling these materials to their members.

If you would like more information or have any questions, please contact Bob Lash, Chief, Transmission Branch, at 202-720-0486 or at blash@rus.usda.gov.

## RUS Fiberglass Crossarm Requirements

In 2000, RUS added fiberglass crossarms to Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers." Since then, a number of manufacturers have been added to the List of Materials designated as Item g. The requirements have basically followed the same as wood crossarms:

- Modulus of rupture ≥ 7400 psi
- Modulus of elasticity ≥ $1.8 \times 10^6$ psi
- Flashover testing
- Transverse & longitudinal pin testing
- Standard sizing
- Standard attachment method
- Accelerated weathering testing

Standard sizing is an important RUS requirement to ensure that accepted fiberglass crossarms are dimensionally interchangeable with currently used wood arms and hardware. This provides the utility the option to use hardware already in inventory, considerably reducing hardware cost. The same is true for standard drilling patters or material that can be field drilled. Having a material that is consistent with mounting and hardware attachments as wood crossarms saves time and expense.

Variations of composite crossarms exist in the market, such as plastic and rubber, but currently and until other materials can be shown to offer equivalent performance, RUS is only considering the acceptance and listing of "fiberglass" as an alternative to wood crossarms. RUS believes that fiberglass crossarms have exhibited a reliability that has proved comparable to that of wood. Wood is still the basic construction material for RUS, but for those borrowers needing an alternative, fiberglass is worth investigating.

If you would like more information, have any questions, or wish to obtain a copy of our "Items Required in an Application for RUS Acceptance of Fiberglass Crossarms," please contact Bob Lash, Chief, Transmission Branch, at 202-720-0486 or at blash@rus.usda.gov or Norris Nicholson, Electrical Engineer, Transmission Branch, at 202-720-1924 or at nnichols@rus.usda.gov.

# ADMINISTRATIVE and OTHER

## Help Develop the 2007 Edition of the National Electrical Safety Code

NESC Importance - The National Electrical Safety Code (NESC) is an extremely important document for all utility companies, including electric utilities. The NESC is an American National Standards Institute (ANSI) standard that covers the basic provisions for safeguarding the public and utility personnel from hazards arising from the installation, operation and maintenance of: (1) conductors and equipment in electric supply stations, and (2) overhead and underground electric supply and communications lines. The document includes work rules for the construction, maintenance and operation of electric supply and communications lines and equipment. This is one of the key documents always referred to in court cases involving accidents related to electric or communications utility facilities. It is important to Rural Utilities Service (RUS) borrowers also because RUS requires borrowers to design, install, operate, and maintain electric facilities, in conformance with the NESC. The NESC is such a crucially important safety document to RUS borrowers that RUS staff members participate on the bodies that maintains the document.

C2 Secretariat - The Institute of Electrical and Electronics Engineers, Inc., (IEEE) through its C2 Committee is the ANSI Secretariat responsible for maintaining the NESC. The C2 Committee performs its duties via seven subcommittees consisting of balanced numbers of volunteer engineers and individuals from other technical and non-technical fields all representing utilities, manufacturers, government agencies, professional societies and associations, and unions. RUS maintains membership on the Main Committee and four of the seven subcommittees: Grounding Methods, Overhead Lines-Clearances, Overhead Lines-Strength and Loading, and Underground Lines, respectively. In this capacity, RUS is able to follow the direction that NESC changes take and can better help to assure that the rural utility concerns are appropriately considered in final, approved, revised editions.

Proposed NESC Change Submittal Phase - C2 is now in the process of developing the 2007 Edition of the NESC and those involved in the design, construction, operation, and maintenance of rural electric facilities can take part in the development of the 2007 edition. At the present time and up until July 17, 2003, the C2 Secretariat is accepting proposals from the public to change the current edition of the NESC (the 2002 Edition). This is the time for people that work in the rural electric utility industry to assist themselves and their organizations by writing and submitting change proposals to help correct omissions, errors, or other problems that they have encountered in using the 2002 Edition of the NESC.

Change Proposals – The C2 Secretariat requires NESC change proposals to be submitted to it on a standardized form that it has developed. The form helps to make the committee and subcommittee review manageable and timely. The form can be found on Page 281 of the 2002 NESC. Copies of the NESC can be obtained from the IEEE at 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331 or by telephone at 1-800-678-IEEE. Ask for C2-2002, "National Electrical Safety Code (2002)."

The following time schedule has been established to complete the 2007 revision:

| | |
|---|---|
| October 5 through 24, 2003 | NESC Subcommittees meet to consider all the change proposals submitted by the public |
| September 1, 2004 | Preprint of the Subcommittees' resolutions of the public comments and the amendments that Subcommittees produce as a result of the comments; these are the amendments the subcommittees propose for incorporation into the 2007 NESC. |
| May 1, 2005 | Deadline for the public and interested parties to submit comments concerning the subcommittees' proposed amendments published in the September 1, 2004, Preprint |
| October 2 through 20, 2005 | NESC Subcommittees meet to consider the public comments regarding the subcommittees' proposals published in the September 1, 2004, Preprint. |
| January 15, 2006 | The Proposed revision of the NESC that is prepared after considering the public comments is submitted to the NESC Main Committee for Ballot and to ANSI for concurrent public review. |
| May 15, 2006 | The NESC Main Committee approved revision of the NESC is sent to the American National Standards Institute (ANSI) for consideration as an ANSI standard. |
| August 1, 2006 | 2007 Edition of the NESC is published. |

For further information on the NESC please contact the following:

Main Committee: George Bagnall .....(202) 720-1900
Subcommittee 2, Grounding Methods: Harvey Bowles .....(202) 720-0980
Subcommittee 4, Overhead Lines-Clearances: Jim Bohlk .....(202) 720-1967
Subcommittee 5, Overhead Lines-Strength and Loading: Don Heald .....(202) 720-9102
Subcommittee 7, Underground Lines: Trung Hiu .....(202) 720-1877

## NRECA Joins C2 Committee of NESC

Recently the National Rural Electric Cooperative Association (NRECA) requested and received acceptance as a voting member of the Main C2 Committee of the NESC and offers its membership a hands-on means of following the NESC changes and assuring that the rural electric utility perspective is included in any resulting C2 Committee change acceptances. The NRECA C2 Membership is to be as follows:

| NESC Committee | Main Member | Affiliation |
|---|---|---|
| Main Committee | Bob Saint* | NRECA |
| Subcommittee 2<br>Grounding Methods | Bob Saint | NRECA |
| Subcommittee 3<br>Electric Supply Stations | Keith Harrison | Northeast Missouri Electric Power Cooperative |
| Subcommittee 4<br>Overhead Lines-Clearances | Ernie Neubauer | Pioneer Rural Electric Cooperative |
| Subcommittee 5<br>Overhead Lines-Strength and Loading | Chuck Bishop | Farmers Rural Electric Cooperative |
| Subcommittee 7<br>Underground Lines | Mike Pehosh | NRECA |
| Subcommittee 8<br>Work Rules | Ken Brubaker | NRECA |

* Mike Pehosh, NRECA, will be Mr. Saint's Alternate on the Main Committee.

For further information, please contact:

Bob Saint
National Rural Electric Cooperative Association (NRECA)
Mail Code: SS9-204
4301 Wilson Blvd.
Arlington, VA 22203-1860
Phone: 703-907-5863
Fax: 703-907-5518

## Revision of Electric Program Standard Contract Forms

The Rural Utilities Service (RUS) is pleased to announce the publication of a proposed rule to revise the electric program standard contract forms, which was published in the Federal Register on July 2, 2002, at 67 FR 44396. This proposed rule affects 7 CFR 1724, Electric Engineering, Architectural Services and Design Policies and Procedures, 7 CFR 1726, Electric System Construction Policies and Procedures, and 7 CFR 1755, Telecommunications Standards and Specifications for Materials, Equipment, and Construction. The comment period for this proposed rule ends October 30, 2002.

RUS is proposing to update, consolidate, and streamline these standard forms of contracts. These changes are needed to improve the usefulness of the standard forms of contract and to make it easier for RUS borrowers and engineers to utilize these standard forms of contract. The proposed revisions to the contract forms include:

1. Eliminate unneeded forms. This includes merging Form 181 into Form 187, merging Form 180 and 792c into Form 238, merging Form 201, 203, and 764 into Form 830, and eliminating Forms 180, 181, 201, 203, 764 and 792c. We are also proposing to eliminate infrequently used guidance forms (Forms 172, 173, 274, 282, and 458.)

2. Make forms suitable for "subject to" or "not subject to" RUS approval. This includes merging Form 831 into Form 830 and eliminating Form 831.

3. Make construction contract forms suitable for "labor only" or "labor and material." This includes merging Form 792 into Form 790 and eliminating Form 792.

4. Standardize tables and information pages and incorporate them as separate attachments. RUS is planning to publish the "Construction Units" pages as a separate bulletin. This would allow the borrower to include in its bid package only those construction unit pages that are relevant to a particular project.

5. Maximize consistency among forms. This includes standardizing common provisions and terminology, and adding a "Notice and Instructions to Bidders" to forms that currently do not have one. This also includes restructuring Form 198, Equipment Contract, to a "proposal" and "acceptance" format (like the other forms), and adding certain provisions, such as insurance and protection to persons and property, applicable to work performed at the project site, such as technical assistance during installation.

6. Add a provision regarding assignment of the contract to RUS for security purposes.

7. Update and clarify certain contract provisions in Forms. This includes:

    a. Clarify that the contractor (not the owner or engineer) is solely responsible for the means and methods of construction and for the supervision of the contractor's employees;

    b. Delete the reference to a "Supervisor" appointed by RUS;

    c. Delete the reference to the loan contract and owner's access to funding;

    d. Delete the option for eliminating retainage after the contract is 50 percent complete;

    e. Update the "Buy American" and "Civil Rights" requirements; and,

f. Eliminating gender specific terms such as him, his, and materialmen.

The comment period for the proposed rule ends on October 30, 2002. These documents may be accessed on the RUS web site at http://www.usda.gov/rus/electric/regs.htm.

If you would like more information or have any questions, please contact Fred Gatchell, Deputy Director, Electric Staff Division, at 202-720-1398 or at fgatchel@rus.usda.gov.

## RUS Data Collection System

RUS has developed an electronic Internet based Data Collection System (DCS) that is currently being used to collect Operating Report Data from Electric Distribution Borrowers (Form 7) and Telecommunications Borrowers (Form 479). The DCS uses the Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP) Internet protocols.

The DCS replaces a diskette-based system used to collect the Form 7 and an E-mail based system used to collect the Form 479. RUS can update the system at anytime problems are discovered. These updates can and do include program changes and changes to support information such as the list of electric utilities that sell electricity. The borrower can download historic data using the DCS. This data is used as a check of the form being completed. The DCS requires an active Internet connection during the data download (that is generally done only once), each time the program is started, and when a submission is being created. The DCS does not work interactively across the Internet. This means that during the most time-consuming phase of the use of the program (entering data into the form), the borrower does not need to be connected to the Internet. It also means that there is not a complicated recovery process if the borrower's Internet connection is lost.

If a borrower discovers that an error was made after a submission has been sent to RUS, the borrower can make corrections and resubmit at any time. RUS has over 83 resubmissions of Form 7 data and approximately 28 resubmissions of Form 479 data.

The response from RUS borrowers has exceeded RUS expectations in two respects. Most borrowers are using the DCS and on the whole RUS is receiving the information in a much more timely manner. To date, of the 615 Electric Distribution Borrowers that have filed, only 2 filed using a diskette and only 3 have filed on paper. For Form 479, all 678 submissions were made using the Internet based DCS.

Three main problems have surfaced during the initial use of the system:

1. The Form 7 prints one section per page resulting in a 19 page output. Making a modification to the program to put more than one section on a page and slim down the number of pages printed is being considered by RUS.

2. Where a borrower or its Internet Service Provider (ISP) has both firewall and proxy server software, the borrower cannot use the DCS without modifying the setup on the borrower's system or having the ISP modify its setup. Firewall and proxy server software are two types of software that limit access to the Internet and the Internet's access to a computer. In general, the combination of firewall and proxy server software has limited the borrower's access to our server such that the system will not work. In cases where both types of software are in use, the borrower has had to make an adjustment so that the DCS can be used.

3. Borrowers have not all sent in the signed copy of the first page of the Form. Since there was no approved electronic signature system when the DCS was originally developed, RUS still requires that the first page of each form be signed and mailed to RUS.

RUS is developing the software that allows RUS to process the Forms when they are received by RUS. This software allows RUS to view and print the Form, check the status of the collection and review the warning explanations provided by borrowers. The review of warning explanations will in some cases result in RUS requesting changes or further explanations from the borrowers.

The DCS is being expanded to allow collection of Electric Generation and Transmission Borrower Operating Report Data (Form 12).

RUS is also in the planning stage of developing a DCS for the Form 87, "Request For Mail List Data."

If you would like more information or have any questions, please contact Marshall Duvall, Staff Engineer, Electric Staff Division, at 202-720-0096 or at mduvall@rus.usda.gov.

## The RUS Website

The World Wide Web is the gateway to the information highway. The use of a personal computer that is connected to the World Wide Web enables one to easily find and retrieve data, rules, regulations, periodicals and other publications. The Rural Utilities Service maintains a website that serves its borrowers and others interested in the rural utility infrastructures. The website is not static, but rather it is dynamic, sometimes changing almost daily, to provide up-to-date information. The RUS Website is found at:

**http://www.usda.gov/rus**

The Electric Staff Division has responsibility for the Electric Program portion of the website. This allows us to better respond to your needs and to post information to the webserver in a more timely fashion. The Electric Program home page is found at:

**http://www.usda.gov/rus/electric**

To help you navigate around the Electric Program web pages, the home page provides a description of the various pages.

The Loans page provides a "thumbnail sketch" of the Electric Program's loan offerings and the Rates page includes a table showing municipal rates for the current quarter, as well as the daily FFB and Treasury loan rates. This municipal rates on this page are updated at the beginning of each quarter. Although this information is printed in the Federal Register, it is available first on the RUS website. The Treasury and FFB loan program rates are updated daily.

The Service page provides an overview of the Electric Program, its customer–oriented program delivery, outlines the various divisions and their roles, and provides "box scores" of the Electric Program's current Fiscal Year loan program. The box score is updated at the beginning of each month.

Have you wanted to contact RUS, but did not know where to start? The Contacts page starts off with the office of the Assistant Administrator. Each division – Northern Regional Division, Southern Regional Division, Power Supply Division, and the Electric Staff Division – has a listing of the staff within that division. You may also select a particular state to see a listing of the staff responsible for that state. These pages include staff names, titles, phone numbers, fax numbers, and E-mail and postal mail addresses.

The Regulations page contains RUS regulations affecting electric borrowers as well as proposed regulations that are open for public comment.

The Bulletins page contains RUS Electric Program bulletins in various formats – Word, PDF, text, and HTML. New bulletins are generally available on the website prior to the printed copies being distributed.

Looking for engineering information? Check out the Engineering page. It contains various items of interest to the rural electric engineering community.

Do you need a copy of the latest List of Materials? Check out the List of Materials page. The List is available in Adobe Acrobat PDF format and is updated after every meeting of the Technical Standards Committees. The file includes bookmarks and links to help you find what you are looking for. We hope to convert the List to a database format in the near future. This will provide search and query capability and you should be able to link to it from other software.

As you leave the Electric Program web pages, the Exit/Links pages provide you with a borrower directory, broken down by state, with links to a number of RUS electric borrowers, as well as electric industry and government resources, including state commissions, Federal agencies, and other sites of interest.

Do your kids know about RUS? Invite them to look at the RUS “kids page” at http://www.usda.gov/rus/educate/ruskids.htm and meet Rus the Surfin’ Squirrel. There are safety tips, games, as well as other information about the RUS programs.

Be sure to check out the rest of the RUS website for information about the other RUS programs - Telecommunications Program (including the RUS Distance Learning and Telemedicine Grant and Loan Program) and the Water and Environmental Programs.

The RUS Electric Program website is a work in progress. It is in a state of constant revision. Check it often. Also, check our "What's New" page to learn of recent changes to the website. If you have trouble finding what you want, send an e-mail to: electric@rus.usda.gov.

Please include your name, e-mail address, telephone number, and company affiliation in the body of your message so that we may be able to contact you for additional information, if necessary. The RUS website is your website and we want to provide the information you need. Please provide us with your suggestions.

If you would like further information or have any questions, please contact Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at 202-720-0980 or at hbowles@rus.usda.gov.

## RUS Technical Publications

RUS has issued a number of technical publications recently. These publications include:

RULES:

- **7 CFR 1710, Subpart H, "Demand Side Management and Renewable Energy Systems."** This proposed rule, dated April 25, 2001, would eliminate Subpart H in its entirety . The existing subpart H details separate policies and requirements for loans for renewable energy systems and demand side management. Many of these requirements overlap provisions found elsewhere in part 1710. Others do not seem well suited for the smaller scale projects of the type that are becoming increasingly common in the industry. RUS believes that it is more appropriate to consider such small scale projects in this rapidly developing segment of the energy industry by proceeding on a case-by-case basis.

  For more information, please contact Georg Shultz of ESD at 202-720-1920 or at gshultz@rus.usda.gov.

- **7 CFR 1726, Revision of Electric Program Standard Contract Forms.** This proposed rule, dated July 2, 2002, would update, consolidate, and streamline our standard forms of contracts. This would include the elimination of unneeded forms, making forms suitable for "subject to" or "not subject to" RUS approval, making construction contract forms suitable for "labor only" or "labor and material," standardizing tables and information pages and incorporate them as separate attachments, maximizing consistency among forms, and updating and clarifying contract provisions as necessary. These changes are being made to improve the usefulness of the standard forms of contract.

  For more information, please contact Fred Gatchell of ESD at 202-720-1398 or at fgatchel@dus.usda.gov.

GUIDANCE DOCUMENTS:

- **Bulletin 1724D-112, "The Application of Shunt Capacitors to the Rural Electric System,"** dated April 27, 2001. This bulletin examines the application of shunt capacitors on rural distribution systems and serves as a general guide for capacitor applications to RUS borrowers and others. The System Planning Subcommittee of NRECA's T&D Committee has been instrumental in the development of this bulletin. This is an update of an existing bulletin, which was known as Bulletin 169-1 with the same title.

  For more information, please contact Chris Tuttle of ESD at 202-205-3655 or at ctuttle@rus.usda.gov.

- **Bulletin 1724E-153, "Electric Distribution Line Guys & Anchors,"** dated April 25, 2001. This guide bulletin provides information needed to properly design guying for conductors attached to wood distribution poles. To this end, the bulletin contains data, equations, and sample calculations. The bulletin also contains information regarding standard RUS anchor and guying assemblies and their component parts to assist the user in the proper selection and installation of these assemblies. This bulletin replaces one of the chapters of REA Bulletin 160-2, "Mechanical Design Manual for Overhead Distribution Lines."

  For more information, please contact Jim Bohlk of ESD at 202-720-1967 or at jbohlk@rus.usda.gov.

- **Bulletin 1724E-214, "Guide Specification for Standard Class Steel Transmission Poles,"** dated July 2, 2001. This guide specification provides a basis for procuring direct embedded standard class steel poles for transmission lines. For more information, see the article of the same title included in this issue of the Items of Engineering Interest.

  For more information, please contact Don Heald of ESD at 202-720-9102 or at dheald@rus.usda.gov.

- **Bulletin 1724E-300, "Design Guide for Rural Substations,"** dated June 7, 2001 This bulletin provides basic information for the design engineer concerning all aspects of substation design. This is an update of an existing bulletin, which was known as Bulletin 65-1 with the same title.

  For more information, please contact Mike Eskandary of ESD at 202-720-9098 or at meskanda@rus.usda.gov.

- **IP 100-1, "Rural Electrification Act of 1936,"** published in May, 2001. This document details the Rural Electrification Act, with amendments through December 31, 2000, along with sections giving the chronology of the Act and guidelines to the provisions of the Act.

  For more information, please contact Robin Meigel of ESD at 202-720-9452 or at rmeigel@rus.usda.gov.

- **IP 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers,"** published in July, 2002, and its quarterly supplements. This document provides a convenient listing of the materials and equipment that will be accepted by RUS.

  For more information, please contact Harvey Bowles of ESD at 202-720-0980 or at hbowles@rus.usda.gov.

If you need any of these publications, please contact RUS' Program Development and Regulatory Analysis staff at 202-720-8674. Many RUS publications are also available via the Internet at:

*For Rules:* **http://www.usda.gov/rus/electric/regs.htm**

*For Bulletins:* **http://www.usda.gov/rus/electric/bulletins.htm**

PUBLICATIONS IN PROGRESS

**Timber Specifications:** RUS is in the process of revising the following three bulletins that cover pressure treating of poles and crossarms, and their respective quality control:

- **Bulletin 1728F-700, "RUS Specification for Wood Poles, Stubs and Anchor Logs,"**
- **Bulletin 1728H-701, "RUS Specification for Wood Crossarms (Solid and Laminated) Transmission Timbers and Pole Keys"** (7 CFR 1728.201), and
- **Bulletin 1728H-702, "RUS Specification for Quality Control and Inspection of Timber Products"** (7 CFR 1728.202).

Topics currently being considered for revision include:

- Elimination of the requirement for borrowers to notify RUS of their timber product purchases during the previous year,
- Reinstatement of the acceptance and listing of inspection agencies in the RUS List of Materials,
- Requirement for a heat sterilization during kiln drying or steam conditioning of poles,

- Requirement for inspection agencies to have their company designation branded or tagged on the pole face,
- Requirement for all independent inspectors and plant quality control personnel to be trained and certified by x-ray fluorescence instrument manufacturer,
- Requirement for treating plants and inspection agencies to maintain certain levels of liability insurance and errors and omission insurance, and
- Include butt treating of cedar poles as an acceptable method of treatment for poles.

RUS is soliciting input from electric borrowers and others as to necessary changes to these bulletins. Comments or suggestions should be sent to H. Robert Lash, Chief, Transmission Branch, RUS, Stop 1569, 1400 Independence Ave SW, Washington, DC 20250-1569, E-mail: blash@rus.usda.gov. All comments are welcome.

RUS is also working on the following publications:

- **Bulletin 1724D-114, "Voltage Regulator Application on Rural Distribution Systems."** This bulletin will examine the application of voltage regulators on rural distribution systems and serve as a general guide for voltage regulator applications to RUS borrowers and others.

  For more information, please contact John Pavek of ESD at 202-720-5082 or at jpavek@rus.usda.gov.

- **Bulletin 1724E-151, "Mechanical Loading on Distribution Crossarms."** This bulletin will present equations, data, and other information needed to determine mechanical loading on wood distribution crossarms and crossarm assemblies. This bulletin will replace one of the chapters of REA Bulletin 160-2, "Mechanical Design Manual for Overhead Distribution Lines."

  For more information, please contact Jim Bohlk of ESD at 202-720-1967 or at jbohlk@rus.usda.gov.

- **Bulletin 1724E-152, "The Mechanics of Overhead Distribution Line Conductors."** This bulletin will present and explain:

  - The equations needed to calculate ruling spans and conductor sags and tensions,
  - Guidelines for preparing or selecting sag-tension tables,
  - The characteristics, behavior, and installation of distribution line conductors, and,
  - Information regarding aeolian vibration.

  This bulletin will replace one of the chapters of REA Bulletin 160-2, "Mechanical Design Manual for Overhead Distribution Lines."

For more information, please contact Jim Bohlk of ESD at 202-720-1967 or at jbohlk@rus.usda.gov.

- **Bulletin 1728F-804, "Specifications and Drawings for 12.47/7.2 kV Line Construction"** (incorporated by reference.) This will be an update of an existing Bulletin 50-3 with the same title.

  This bulletin will update the specifications and drawings that are to be used by borrowers in the construction of 12.47/7.2 kV overhead electric distribution lines and associated equipment and construction assembly units. It is one of the RUS standards that help borrowers build safe, reliable, and economical electric facilities in rural America. Listed below are some of the significant changes and additions which are being considered in connection with the update of this bulletin:

  The bulletin will be reformatted into 19 separate sections or categories. Most of the sections contain construction specifications, an index of drawings, and construction drawings of assemblies designed to perform a similar function.

  * New tables will be added to define maximum line angles, permitted unbalanced conductor tensions, and soil classification data. Appendix 1 at the end of the bulletin will document the formula and data used to determine the line angles in the tables. Appendix 2, also at the end of the bulletin, will document the formula and data used to determine permitted unbalanced conductor tensions.

  * All of the drawing numbers will be changed to a uniform format in which each character in the number has a functional meaning. However, most of the drawings and assemblies, brought forth from previous Bulletin 50-3, will also show the same numbers previously used in Bulletin 50-3. Borrowers may use at their discretion either the old numbers or the new numbers for these assemblies.

  * Each drawing has been given a new, shorter, and more uniform title or name.

  * "Design parameters", which define and usually limit maximum line angles or mechanical loading (tension), will be added to most of the drawings.

  * Several new construction "guide" drawings will be added which will show the configuration and spacing of more than one assembly on a structure, or will show the installation details of full or partial assembly units. These drawings will not list the material used.

  * A set or coordinated, three-phase "narrow profile" assemblies and drawings will be incorporated into this bulletin.

  * New conditions and specifications for the use of stirrups will be added. (See Section L)

For more information, please contact Jim Bohlk of ESD at 202-720-1967 or at jbohlk@rus.usda.gov.

If you would like more information or have any questions, please contact Fred Gatchell, Deputy Director, Electric Staff Division, at 202-720-1398 or at fgatchel@rus.usda.gov.

## The National Food and Energy Council

The National Food and Energy Council (NFEC) is an association of over 150 electric cooperatives, investor-owned utilities, and other organizations whose primary goal is to help its members serve their rural customers. This assistance is provided by development and distribution of educational materials, training courses, and by direct technical assistance to members. Originally formed to help utilities with their agricultural customers, NFEC has recently expanded its scope. NFEC now provides technical support and assistance to help power suppliers with their rural businesses and commercial key accounts. Specific topics include motor efficiency, security lighting for businesses, standby generator sizing and distributed generation sources, key accounts programs, wiring or grounding upgrades for power quality, and new options for serving three-phase loads with single-phase service. RUS and NRECA are working with NFEC to help rural electric cooperatives improve the quality of life in rural America by enhancing the safe and efficient use of electric power.

If you would like more information or have any questions, please visit the NFEC website at www.nfec.org or contact Fred Gatchell, Deputy Director, Electric Staff Division, at 202-720-1398 or at fgatchel@rus.usda.gov.

## RUS 2002 Electric Engineering Seminar

On March 5 and 6, 2002, RUS held its 2002 Electric Engineering Seminar in Dallas, TX, in conjunction with NRECA's Tech Advantage 2002. The seminar attracted engineers and technical personnel from throughout the rural electric community and explored the latest developments in the electric industry as they relate to RUS' role in rural America. Topics included Practical Electric Power Quality and Renewable Energy for Rural America as well as updates on RUS technical publications and activities. More detailed information concerning the presentations can be found at:

**http://www.usda.gov/rus/electric/engineering/2002seminar.htm**

RUS is planning to hold a similar seminar in early 2004. Any ideas for topics, speakers, or other matters would be greatly appreciated. Please send your ideas to Fred Gatchell as indicated below.

If you would like more information or have any questions, please contact Fred Gatchell, Deputy Director, Electric Staff Division, at 202-720-1398 or at fgatchel@rus.usda.gov.

## NRECA T&D Overhead Lines Subcommittee

In 1991, NRECA established its Transmission and Distribution Engineering Committee (T&D Committee) to work with RUS (then REA) in the development and maintenance of electric transmission and distribution standards and specifications, and the exchange of engineering information of mutual interest to rural electric utilities. Currently there are over 75 cooperative engineers, purchasing professionals, and consultants devoting time and energy on the seven active subcommittees. There is also an RUS representative on each subcommittee.

We want to use this opportunity to thank these individuals and the organizations that sponsor their participation. See Appendix B for the T&D Committee Roster.

The NRECA T&D Overhead Lines Subcommittee consists of 8 engineers representing electric cooperatives from various parts of the country plus liaison persons representing consulting engineers, NRECA and RUS. The group meets twice annually. Presently the subcommittee is working on the following projects:

Operations Manual (to be published by NRECA.) This new manual is being written as a practical day-to-day and emergency "how to" manual for operations managers at electric cooperatives. The first draft of the manual is complete except for a couple of short sections.

RUS Bulletin 160-2 "Mechanical Design Manual for Overhead Distribution Lines" (1982) is being re-written as the following four technical guide bulletins. These bulletins are being published by RUS. (Upon completion of these bulletins, Bulletin 160-2 will be rescinded.)

- RUS Bulletin 1724E-153, "Electric Distribution Guys and Anchors." This project is complete and has been published by RUS

- New RUS Bulletin 1724E-152, "The Mechanics of Overhead Distribution Line Conductors." This project is virtually completed. We are awaiting final RUS approvals, signatures and publication.

- New RUS Bulletin 1724E-150, "Loading on Wood Distribution Poles." The first draft of this new bulletin is nearly completed; however, the author has encountered computer software problems which have delayed completion. It is hoped that a draft will be completed and ready for comments later this year.

- New RUS Bulletin 1724E-151, "Mechanical Loading on Distribution Crossarms." The first draft of this bulletin has been written and routed for comments. This bulletin is scheduled for completion later this year.

RUS Bulletin 1726A-125 "Joint Use Agreement with CATV Companies." The subcommittee has just recently started to review this bulletin and plans to revise and rewrite it. The subcommittee members and a legal staff are presently scrutinizing two different versions of joint use agreements being used by two different cooperatives. It is anticipated that this project will take about two years to complete.

Magnesium Chloride NRECA has reported that a detailed Magnesium Chloride survey has been prepared and will be sent to various interested and knowledgeable organizations to determine specifically where, and to what extent, problems (if any) are encountered with this chemical de-icer.

If you would like more information or have any questions, please contact Jim Bohlk, Electrical Engineer, Distribution Branch, at 202-720-1967 or at jbohlk@rus.usda.gov.

# Selected Metric Conversion Factors

| TO CONVERT FROM: | TO: | MULTIPLY BY: |
|---|---|---|
| Inch (in) | Centimeter (cm) | 2.54 |
| Foot (ft) | Meter (m) | 0.3048 |
| Mile (mi) | Kilometer (km) | 1.609 |
| Pound (lb) | Newton (N) | 4.448 |
| Gallon | Liter | 3.785 |

**APPENDIX A**

# RURAL UTILITIES SERVICE
# ELECTRIC STAFF DIVISION

## Office of the Director

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**Norris Nicholson** — Electrical Engineer
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*Updated August 2002*

# APPENDIX B

## NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

| MEMBER | ORGANIZATION | LOCATION |
|---|---|---|
| **Committee Chair** | | |
| **Overt Carroll** | Clark Energy Co-op | Winchester, KY |
| **NRECA Staff Coordinators** | | |
| **Steve Lindenberg** | NRECA | Arlington, VA |
| **Mike Pehosh** | NRECA | Arlington, VA |
| **Bob Saint** | NRECA | Arlington, VA |
| **Materials Subcommittee** | | |
| **John Mitchell, Chair** | Rappahannock EC | Fredericksburg, VA |
| **Harvey Bowles** | RUS | Washington, DC |
| **Susan Brouse** | Great River Energy | Elk River, MN |
| **Tom Denison** | Cobb EMC | Marietta, GA |
| **Craig Dickson** | La Plata Electric Association | Durango, CO |
| **Charles Emerson** | Trico EC | Tucson, AZ |
| **George Keel** | RUS | Washington, DC |
| **Carl Liles** | Western Farmers EC | Anadarko, OK |
| **Peter Platz** | Coast EPA | Bat St. Louis, MS |
| **Scott Wehler** | Adams Electric Co-op | Gettysburg, PA |
| **Overhead Distribution Lines Subcommittee** | | |
| **Terry Rosenthal, Chair** | Laclede EC | Lebanon, MO |
| **Jim Bohlk** | RUS | Washington, DC |
| **James Byrne** | Poudre Valley REA | Fort Collins, CO |
| **Allan Glidewell** | Southwest Tennessee EMC | Brownsville, TN |
| **Tom Hoffman** | Agralite Electric Co-op | Benson, MN |
| **Brian Nelson** | Intercounty ECA | Licking, MO |
| **Gene Smith** | SGS Witter, Inc. | Lubbock, TX |
| **Tom Suggs** | Middle Tennessee EMC | Murfreesboro, TN |

# APPENDIX B

## NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

| MEMBER | ORGANIZATION | LOCATION |
|---|---|---|
| **Substation Subcommittee** | | |
| **Bill Kahanek, Chair** | Lower Colorodo River Auth. | Austin, TX |
| **Jim Bardwell** | SGS Witter, Inc. | Albuquerque, NM |
| **Mike Eskandary** | RUS | Washington, DC |
| **Jerrod Howard** | Central Electric Pwr. Co-op | Columbia, SC |
| **Ken Malone** | Middle Tennessee EMC | Murfreesboro, TN |
| **Tom Myers** | Berkeley EC | Moncks Corner, SC |
| **Paul Rupard** | East Kentucky Power Co-op | Winchester, KY |
| **Allen Xi** | Burns & McDonnell | Houston, TX |
| **System Planning Subcommittee** | | |
| **Ronnie Frizzell, Chair** | Arkansas EC Corp. | Little Rock, AR |
| **Robin Blanton** | Piedmont EMC | Hillsborough, NC |
| **Robin Christianson** | NRECA | Alexandria, VA |
| **Robert Dew** | Power Tech Engineering | Norcross, GA |
| **Dee Futz** | Chugach EA | Anchorage, AK |
| **David Garrison** | Allgeier Martin & Associates | Okmulgee, OK |
| **Don Gray** | SGS Witter, Inc. | Lubbock, TX |
| **Wayne Henson** | East Mississippi EPA | Meridian, MS |
| **Bill Koch** | Rural Elect. Magazine | Seattle, WA |
| **Joe Perry** | Patterson & Dewar Engr. | Decatur, GA |
| **Georg Shultz** | RUS | Washington, DC |
| **Chris Tuttle** | RUS | Washington, DC |
| **Kenneth Winder** | Moon Lake Electric | Roosevelt, UT |
| **Power Quality Subcommittee** | | |
| **Harold Taylor, Chair** | Georgia Transmission Corp | Tucker, GA |
| **Ed Bevers** | Rural Electric Co-op., Inc. | Lindsay, OK |
| **Chris Brewer** | Blue Grass Energy Co-op | Nicholasville, KY |
| **Corbitt Clift** | Cobb EMC | Marietta, GA |
| **Brian Coate** | Tipmont REMC | Linden, IN |
| **Peter Daly** | Power System Engineering | Madison, WI |
| **Herman Dyal** | Clay Electric Cooperative | Keystone Heights, FL |
| **Gary Grubbs** | Farmers RECC | Glasgow, KY |

# APPENDIX B

## NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

| MEMBER | ORGANIZATION | LOCATION |
|---|---|---|
| **Greg Hataway** | Alabama Electric Co-op | Andalusia, AL |
| **Ken Kjar** | Cass County Electric Co-op | Kindred, ND |
| **Wally Lang** | Minnkota Power Co-op | Grand Forks, ND |
| **Chris Melhorn** | EPRI PEAC Corporation | Knoxville, TN |
| **David Mueller** | Electrotek Concepts, Inc. | Knoxville, TN |
| **Jim Newberg** | Missoula Electric Co-op | Missoula, MT |
| **John Pavek** | RUS | Washington, DC |
| **Chris Perry** | Nolin RECC | Elizabethtown, KY |
| **Jeff Pogue** | Wabash Valley Power Assoc | Indianapolis, IN |
| **Lewis Shaw** | Brunswick EMC | Shallotte, NC |
| **Michael Watson** | Duck River EMC | Shelbyville, TN |
| **Transmission Lines Subcommittee** | | |
| **John Burch, Chair** | Florida Keys EC | Tavernier, FL |
| **Dominic Ballard** | East Kentucky Power Co-op | Winchester, KY |
| **Don Heald** | RUS | Washington, DC |
| **Robert Johnson** | Arkansas EC Corp. | Little Rock, AR |
| **Charles Lukkarila** | Great River Energy | Elk River, MN |
| **Charles (Bubba) McCall** | Georgia Transmission Corp. | Tucker, GA |
| **Norris Nicholson** | RUS | Washington, DC |
| **Bob Oldham** | Southern Maryland EC | Hughesville, MD |
| **Art Smith** | Patterson & Dewar Engr. | Decatur, GA |
| **David Turner** | Lower Colorado River Auth. | Austin, TX |
| **John Twitty** | Alabama EC | Andalusia, AL |

# APPENDIX B

## NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

| MEMBER | ORGANIZATION | LOCATION |
|---|---|---|
| **Underground Distribution Subcommittee** | | |
| **Ace Necaise, Chair** | Singing River EPA | Lucedale, MS |
| **Russ Dantzler** | Mid-Carolina EC | Lexington, SC |
| **Berl Davis** | Palmetto EC | Hilton Head, SC |
| **Vince Heuser** | Nolin RECC | Elizabethtown, KY |
| **Trung Hiu** | RUS | Washington, DC |
| **Tim Mobley** | Berkeley EC | Moncks Corner, SC |
| **John Rodgers** | Nodak EC, Inc. | Grand Forks, ND |
| **Blaine Strampe** | Federated REA | Jackson, MN |
| **Ed Thomas** | Utility Elec. Consultants | Raleigh, NC |
| **Keith Thomason** | Middle Tennessee EMC | Murfreesboro, TN |
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