

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

BULLETIN 1724D-106

SUBJECT: Considerations For Replacing Storm-Damaged Conductors

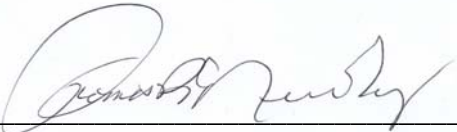
TO: RUS Electric Borrowers

EFFECTIVE DATE: Date of Approval

OFFICE OF PRIMARY INTEREST: Distribution Branch, Electric Staff Division

AVAILABILITY: This is a new guide bulletin and is available on the Rural Utilities Service website at <http://www.usda.gov/rus/electric/bulletins.htm>

PURPOSE: Immediately after a major storm like a hurricane, electric utility personnel are very busy and focused on restoring electric service. Often during this period of service restoration and commotion, electric utility engineers or others have to make an immediate decision on whether to simply re-install downed or damaged conductors or to replace them with new conductors. This bulletin provides guidelines that will assist Rural Utilities Service (RUS) borrowers to expediently make this decision.



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7/1/05

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INDEX:

Conductors, Distribution
 Conductors, Transmission

ABBREVIATIONS

ACSR	Aluminum Conductor Steel Reinforced
CWP	Construction Work Plan
LRP	Long Range Plan

DEFINITIONS

For the purposes of this bulletin, the following definitions apply:

Storm (or major storm) - A major natural catastrophic event such as a hurricane, tornado, flood, forest fire or an ice storm.

Line Section - All of the spans between guyed, dead-end, poles or structures. (In this bulletin it is assumed that new conductors will be installed and sagged in the entire line section because that is the standard method of installing new conductors.)

Conductor-Span - One span of one primary phase or a neutral conductor.
 (e.g., 5 spans with 3 phases and a neutral equal 20 Conductor-Spans.) $[5 \times (3 + 1) = 20]$

Downed conductor – A conductor that is lying on or near the ground as the result of a storm. (A downed conductor has usually either been torn away from its pole-top attachments, or it is still attached to the top of a pole that has been broken off.)

Damaged conductor – A conductor that:

Is entirely broken or contains broken strands;

Has been permanently stretched, annealed, or deformed such that cannot be re-installed within predictable sag values or reasonable tension limits;

Is severely pitted, burned, kinked or similarly damaged in other ways;

Has areas of rusted steel or corroded (white powder) aluminum strands; or

Contains one or more splices (with automatic splices or compression type connectors) other than those installed when the conductor was initially installed.

Re-install conductors – Repair if necessary and restore all of the downed or damaged conductors in a line section to their original position before the storm.

Replace conductors - Remove the downed or damaged conductors (even if they have been previously re-installed) and install new conductors of the same size or larger.

FORMS

Questionnaire Form: “Reasons to Replace Stormed-Damaged Conductors”

1 PURPOSE

- a This bulletin presents guidelines for borrowers to use during emergency system restorations when borrowers need to decide without delay whether to re-install or to replace storm-damaged conductors. This bulletin is not to be used for making undamaged conductor replacement decisions normally made in a construction work plan (CWP) or a long-range plan (LRP) that employ additional studies and a much more rigorous analysis.
- b The questionnaire at the end of this bulletin can be used to determine, document, and validate replacing (instead of re-installing) storm-damaged conductors. A knowledgeable utility engineer in the field can complete the questionnaire when conductor replacement decisions need to be made promptly, without the benefit of an engineering study, during restoration activities after a major storm event.

2 RESTORATION OF ELECTRIC SERVICE

- a Immediately after a storm, electric utilities expediently strive to make the distribution supply system safe for the general public, and restore electric service to all consumers in an orderly, prioritized manner (starting from the substation). For example, the restoration of service to hospitals and re-energizing main feeders are deemed high priority. Whenever possible, line workers make good, permanent, repairs to the storm-damaged distribution system. However during emergency conditions, line workers routinely make temporary repairs (including non-standard construction) until the time and resources are available to return and make permanent repairs to restore the distribution supply system to its condition before the storm.
- b For the purposes of this bulletin, it is assumed that all distribution line materials other than conductors (such as poles, crossarms, insulators and transformers) that have been damaged during a storm have been or will be permanently replaced on a “like-with-like” basis. The purpose of such repairs and material replacements is to restore the distribution infrastructure to pre-storm conditions.

3 RUS ACCOUNTING REQUIREMENTS

Borrowers’ activities related to material retirements, new material replacements, and construction and other activities pertaining to storm damage restoration involve accounting procedures that are beyond the scope of this bulletin. However, because of the detailed nature of these accounting provisions, RUS recommends that borrowers refer to RUS Bulletin 1767B-1, “Uniform System of Accounts - Electric Program.” Borrowers should specifically review Accounting Method and Procedure #136, “Storm Damage,” on Page 322 of RUS Bulletin 1767B-1. Copies of RUS Bulletin 1767B-1 are available on the RUS website at: <http://www.usda.gov/rus/regs/bulls/1767b-1.pdf>

4 BENEFITS OF REPLACING STORM-DAMAGED CONDUCTORS

Replacing downed or damaged conductors immediately or soon after a storm will eliminate the duplicate labor and cost of a documented and planned near future replacement of the conductors based on a previous study of voltage, loading, or physical condition needs. Also, replacing downed or damaged conductors immediately or soon after a storm will eliminate the duplicate labor and cost of re-installing the downed and damaged conductors yet another time (or ultimately replacing them) should the old conductors fail again when subjected to another storm before they are replaced.

5 REASONS TO REPLACE DAMAGED CONDUCTORS WITH LARGER CONDUCTORS

If the decision has been made to replace downed or damaged conductors, larger conductors should be installed if:

- a Larger conductors are called for and documented in a current CWP or LRP;
- b The existing conductors are made of steel, Amerductor, Copperweld or hard-drawn copper;
- c The conductors are smaller than #2 ACSR; or,
- d There are known (and preferably documented) undesirable primary voltage drops or primary conductor overload problems that can be attributed to the conductors in the line section in question.

6 CRITERIA FOR REPLACING DOWNED OR DAMAGED CONDUCTORS

- a **If more than 25 percent of the poles need to be replaced** in a line section (excluding poles damaged by the storm), then the downed or damaged conductors should be repaired if necessary and re-installed and a **project to replace the conductors should be delayed** until it can be further engineered and planned. The work required for major pole and conductor replacements is beyond the scope of this conductor replacement bulletin. Thus, the questionnaire at the end of this bulletin is not applicable and should not be used to justify conductor replacement.
- b **If less than 25 percent of the Conductor-Spans in the line section have been downed or damaged as a result of the storm**, then the downed or damaged conductors should be repaired if necessary and re-installed and a **project to replace the conductors should be delayed** until it can be further engineered and planned. A conductor replacement project should be delayed because there are insufficient storm-related reasons to replace all of the conductors in the line section. Thus, the questionnaire at the end of this bulletin is not applicable and should not be used to justify conductor replacement.

- c Otherwise, it may be prudent to replace all of the conductors in a line section as soon as possible. The questionnaire at the end of this bulletin may be used to determine if there is sufficient justification to replace all of the conductors in a storm-damaged line section. However, in the case of relatively new conductors, usually only the damaged phase conductor(s) needs to be replaced if it cannot be reasonably repaired.

- d RUS advocates that if (1) at least two of the first three questions, or (2) at least one of the first three questions plus at least two of the last three questions in the questionnaire at the end of this bulletin are answered with a “YES,” then there are sufficient reasons to replace all of the conductors (with larger conductors, if needed) in the entire line section.

QUESTIONNAIRE FORM: “Reasons to Replace Stormed-Damaged Conductors”

Company: _____ Address: _____

Engineer: _____ Date: _____

Date and type of storm [name] _____

Circuit, lead / line & section location: _____ No. of Spans: _____

Existing Conductor [phases, size & type, age]: _____

Number of Conductor-Spans¹ in the line section; Total Number = _____ Damaged = _____

Description of damage: _____

Number of poles in line section: Total Number = _____ Number Damaged = _____

Proposed Conductor [phases, size & type]: _____

Comments: _____

With Respect to Replacing Conductors in the above Line Section:	YES	NO
#1. Are more than 40 percent of the Conductor-Spans downed or damaged (as a result of the storm combined with prior conductor damages)?		
#2. Have more than 40 percent of the Conductor-Spans been permanently stretched (as a result of the storm combined with prior conductor conditions) such that the conductors cannot be re-installed within predictable sag and reasonable tension limits?		
#3. Are more than 40 percent of the Conductor-Spans of an age or type (such as Copperweld, hard-drawn copper or Amerductor) such that they cannot be repaired with material and equipment normally on hand or in stock?		
#4. Are materials, manpower (including engineering), and equipment available to <u>replace</u> the conductors (and necessary poles) within the next 12 months? (Note: Damaged conductors may need to be temporarily repaired and re-installed until replacement can be performed.)		
#5. Does the average age and condition of the poles warrant installing new conductors without replacing more than 25 percent of the poles not damaged in the storm?		
#6. Are the conductors in the line section currently planned to be replaced or upgraded in the current Construction Work Plan or otherwise within the next 5 years?		

¹ A Conductor-Span means one span of one primary phase or neutral conductor.
 Example: 5 spans with 3 phases and neutral equals 20 Conductor-Spans. [5 x (3 + 1) = 20]