

## Porcelain and Glass Insulators

### Determine the Condition Assessment Value (CAV)

1. **Pin type, porcelain line top, and glass suspension insulators** – Check the condition visually. *Note* – When pin type insulators fail, the top portion separates completely, but it may re-align itself so that it still appears to be intact from the ground.
2. **Porcelain suspension insulators** – To detect punctures when a string has been flashed by lightning or power arcs, use a *Hi-Test Insulator Tester*. Other puncture clues include audible noise, AM radio interference, or rust on the bottom edge of the cap.
3. Determine the Condition Assessment Value (CAV) according to the rating table below. Compare to the illustration photographs for each value.

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#### Rating Table: Lattice Tower Assessment

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CAV	Condition Description (see photo references)
A	Good or like new.
B	Low degree of damage, wear, decay. Minor chips.
C	Moderate degree of damage, wear, decay. Larger chips, cracks, flash or tracking marks, rust stains on metal parts.
D	High degree of damage, wear, decay. Part or all of shell missing, power arc or lightning damage, rust pitting of metal, cotter keys crushed or disengaged.
E	Completely failed or no longer functional.

### Most common defects

**Pin type insulators** – Some earlier insulators become damaged from cement growth and freezing and thawing. Expansion pressure on the porcelain causes radial cracking or separation of portions of the shell.

**Porcelain line top insulators** – When mechanically overloaded, the porcelain fails, which causes a complete separation and drop of the line. The only problem likely to be encountered in the field will be chips in the porcelain and, very rarely, porcelain and end fitting damage due to power arcs.

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### Porcelain suspension insulators:

**Punctures** – Repeated switching or lightning causes a very small tunnel to be punched through the insulator shell between the cap and pin, effectively shorting out the insulator.

**Radial cracking** – On older insulators, radial cracking can electrically short out the insulator, making the string vulnerable to power arcs, which can cause the insulators to separate and drop the phase.

**Circumferential cracking** – With aging, tensile stresses cause circumferential cracks to form in the porcelain next to the skirts, with the same result as from radial cracking.

**Cotter keys disengaged or crushed** – Rough handling during helicopter lifting, crushing of keys by rotational string motion, and short or soft cotter keys can all contribute to the uncoupling of insulators and dropping of the phase.

### Glass suspension insulators:

Toughened glass insulators are better able to withstand power arcs than porcelain units. As well, when the shell is broken off, although the insulator is electrically shorted, it's still capable of carrying full mechanical loads, unlike porcelain insulators.

**Spontaneous shell disintegration** – Toughened glass shells of poor quality can spontaneously disintegrate soon after manufacturing.

**Punctures** – If the outer surface on the glass shell is penetrated, it causes the entire shell to disintegrate into cubic pieces, much like automobile safety glass. At the instant a power arc penetrates the glass shell, the insulator will disintegrate.

**Cotter keys disengaged or crushed.**

## Take corrective action

1. Report the CAV on the *Passport Deficiency Form*. Record minor chips.
2. Replace defective pin type insulators with *line post* insulators.
3. Replace line post insulators if porcelain or glaze damage extends into the narrowest (shaft) portion of the body. For 69 kV installations, replace deformed metal support brackets.
4. Replace glass suspension insulators that have lost the shell. Intact glass insulators are fit for service even if the string has clearly been flashed.

Refer to System Maintenance Standard 81.10-000-2-2, *Suspension Insulator Replacement*, to identify known model and vintage problems. Refer to System Maintenance Standard 81.14-000-4-1, *Insulator—Toughened Glass*, for precautions to take when working around toughened glass.

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### **A** CAV Rating



**Fig. A1:** Good or like new



**Fig. A2:** Good or like new

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