

National Electrical Code Requirements For Grounding PV Systems

A SOLARABCS Paper

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To Ground or Not to Ground

That was the Question

The NEC was first published in 1897

Thomas Edison was generating Direct Current electricity at that time

Grounding was debated from 1892 to 1913 **And still is**

The 1913 NEC had several grounding requirements—mostly AC

The 2011 NEC has 31 pages on grounding plus Art 690 requirements

Much of the Rest of the World (ROW) elected to not ground electrical systems

For the most part, the NEC requires that most electrical systems be grounded

However, Art 690 allows both grounded and ungrounded PV systems



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Grounding?

Definitions Lead to Understanding

Circuit grounding >> The **grounded** conductor

Equipment grounding >> Equipment-**grounding** conductors (EGC)

ROW>> Protective Earth (PE)

Grounding electrode >> Connection to Earth

Grounding-electrode conductors (GEC) >> Grounding system to Electrode



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Do We Have Problems?

Complex and in some cases unclear Code requirements

Unclear standards requirements

Inconsistent application of standards >> Differing hardware

Insufficient training of Installers

Insufficient experience/training of Inspectors

Murphy



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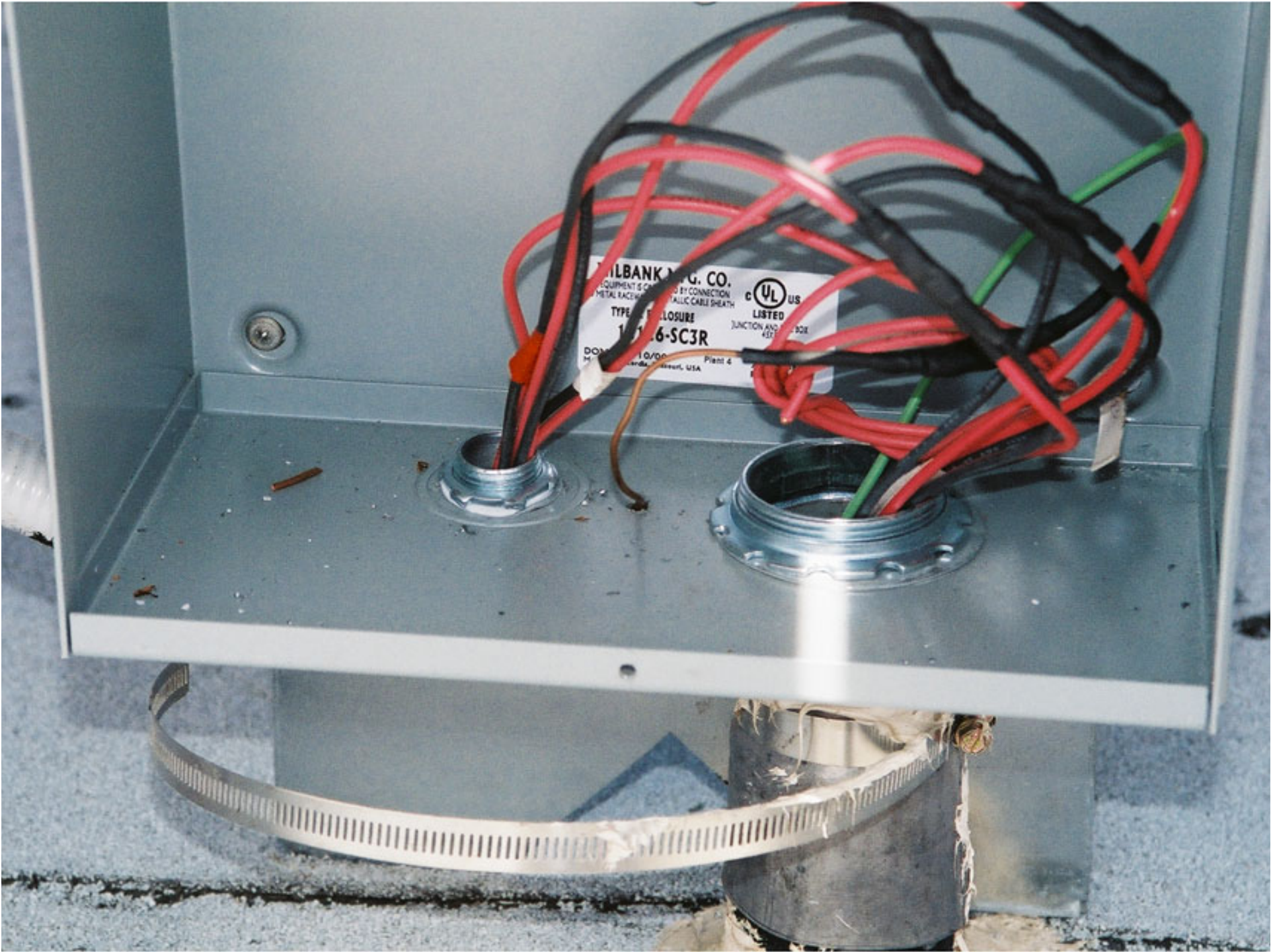


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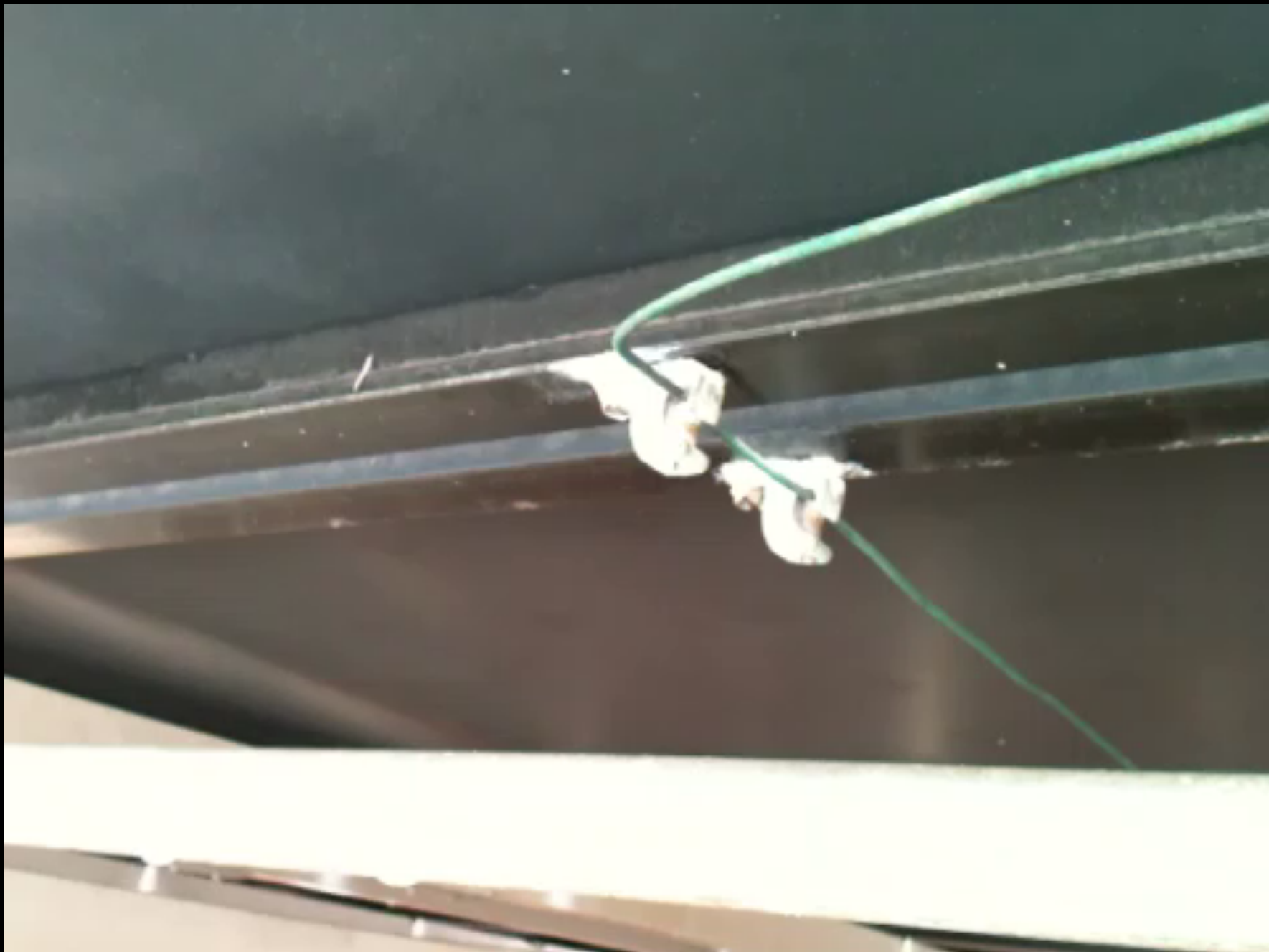


MILBANK MFG. CO.
EQUIPMENT IS CERTIFIED BY CONNECTION
METAL RACEWAY WITH METALLIC CABLE SHEATH
TYPE 1 ENCLOSURE
1/2-6-SC3R
JUNCTION AND BOX
UL LISTED
US
Plant 4
Canada, U.S.A.













06.26.2006

The Paper

Definitions

Equipment-grounding requirements

System grounding requirements

Ground Fault Protection

AC PV Modules and Microinverters

Ungrounded Systems

The Connection to **Mother Earth**

NEC vs. NESC



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Recent Progress in Grounding

May 2012 Release of ANSI/UL 1703

Significantly enhanced module grounding & mounting requirements

Common hardware no longer allowed unless provided

Must follow instructions provided with grounding devices

Must be grounded per instructions or listing not valid

Must be mounted per instructions or listing not valid

Instruction manual and tech notes must be reviewed by NRTL

Proposed for UL 1703 and UL 2703

Racks may not be used to mount or ground modules
unless tested with the specific module



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GROUNDING

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An important key to Public Safety for the next 50+ years



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