



Canadian Standards Association  
Mississauga, Ontario  
**To the Part I Committee**

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Subject No. 1974

Chair: F.L. Kaempffer

Date: March 22, 2005

Title: Interconnection of Grounds between Stations and Plants

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**Submitted by:** CEA

**Proposal:** Accept proposed Rule and Appendix B changes contained in CEA Report 249 D 542 entitled “Interconnection of Grounds between Stations and Plants” dated October 1988.

**Reasons for Request:** Abstract of CEA Report 249 D 542 states: “...to determine the conditions under which the electrical bond between the ground systems of a station and associated plant may be safely broken. This will enable Electrical Engineers, Inspectors and Regulatory Authorities to more easily assess the conditions required for separation of the ground systems.” In the introduction of the same report, it goes on to talk about the hazardous effects of transferring ground fault potential rise from stations to gas plants where sparking at insulation breakdown could cause an explosion. It also says that it would be beneficial to in some instances to separate the plant and station ground systems.

**Chair’s Comments:** The proposed rule and Appendix B amendments are found on pages 116 to 133 in CEA Report 249 D 542. My comments on the proposal are as follows:  
**(The CEA Report was sent to the Subcommittee with the first proposal in July 2002 – NOT attached with this submission)**

- Leave Rule 36-304 the way it is.
- Revise and renumber the proposed rules 36-304 (2) and 36-304(3) to read:  
**36-313 Interconnection of Station and Plant Ground Systems (See Appendix B)**
  - (1) Where the station ground system is interconnected with the ground system of an associated plant, the interconnection shall be fully rated for primary and secondary fault levels. The combined ground impedance of the station and plant shall be permitted to be used to determine the fault current and the ground potential rise.**
  - (2) In addition to the requirements of Sub-rule 36-304(2), the touch and step potentials within and around the plant shall not exceed tolerable levels specified in Table 52.**

- Revise and renumber the proposed rule 36-312 to read:  
**36-314 Separation of Station and Plant Ground Systems (See Appendix B)**  
**Station and plant ground systems shall be permitted to be separated if sub-rules (1) and (2) are met**
  - (1) During primary and secondary ground faults at the station and secondary ground faults at the plant:**
    - (a) The ground system of the station shall control step and touch potentials voltages at the station within Table 52 limits without the contribution of the plant ground system;**
    - (b) The ground system of the plant shall control step and touch voltages at the plant within Table 52 limits without the contribution of the station ground system;**
    - (c) Step and touch voltages exceeding Table 52 limits shall not be created at the station, plant or intervening objects by the voltage gradient between the station and plant ground systems;**
    - (d) Insulation levels shall be adequate for the difference in potential rise of the plant and the station;**
    - (e) Suitable measures shall be taken to prevent the transfer of voltages exceeding Table 52 limits between the plant and station by control, communications and similar circuits; and**
    - (f) The station secondary circuits shall be grounded in a manner which provides an adequate return path for ground faults at either the plant or the station.**
  - (2) Suitable measures shall be in place to:**
    - (a) Prevent accidental interconnection of the station and plant ground systems through fences, pipes, cables or other conductive systems or structures;**
    - (b) Routinely measure and record the effective separation of the station and plant ground systems; and**
    - (c) To maintain suitable warning signage at the station and at each station feeder termination point in the plant indicating that the station and plant ground systems are intentionally isolated.**

In lieu of adding all the proposed Appendix notes (pages 119 to 133 in CEA Report 249 D 542) I suggest that the Appendix B notes read as follows:

**36-313 The design of any interconnection or separation of station and plant ground systems other than explicitly approved by the Rules should be documented and signed by an engineer in addition to being subject to acceptance in accordance with Rule 2-030. Suitable precautions and design guidelines may be found in CEA Report 249 D 542, Interconnection of Grounds Between Stations and Plants.**

**36-314 See the Note to Rule 36-313.**

**Subcommittee deliberations (first round):** Five responses were received. Two agreed with the Chair's proposal, one with comments. Two agreed with the submission. One member disagreed and commented that there still appears to not be enough data to support the need to isolate the two systems and that there must be an identified and proven need to isolate before it is permitted.

**Chair's comments (second round):** The comments of one member who agreed with the Chair's proposal makes the good point that for clarity it should be stated that the existing Rule 36-304 (2002 Code) complete with Sub-rules (1), (2), (3), (4) and (5) stays as is. Also Rule 36-312 (2002 Code) remains as is in its entirety. The change is confined to the addition of two Rules 36-313 and 36-314 plus the Appendix B notes. As to the two respondents who agreed with the submission, I point out that it could not be accepted as is because it was based on a different Rule numbering in a previous edition of the Code. The submission had to be re-numbered in order to be consistent with the current edition of the Code. Hence it would appear that these two votes are actually in agreement with the Chair's proposal. As to the disagreeing voice, I would point out that the CEA report illustrates that the assessment of station ground fault potential rise to plants is a complex exercise and depending on site specific circumstances, the separation of station and plant ground systems is a viable and useful option. From my utility experience, in some cases, this is the only practical option that works to limit hazardous ground potential rise on plant. I am of the opinion that safety in this case would not be well served by staying with a prescriptive rule and not permitting the alternative. In seeking a more firm consensus, please limit your vote to "Agree with the Chair's proposal" as is or with comments and "Disagree with the Chair's proposal for the reasons stated", noting that the current Rules 36-304 and 36-312 are not changed.

**Subcommittee Deliberation:** Five members responded to the 2nd round, all in favour, with the first round proposed rules. Two members had comments. The member who voted "disagree" in the first round changed his vote to "agree" in the 2nd round. The Chair declares a consensus. One member commented that we already have a reference to Report 249 D 541 "Simplified Rules for Grounding Customer-Owned High Voltage Substations" (June 1989) which was at the time recommended for the code and endorsed by the committee. It is quite relevant to have a reference for the second report (which is the topic of Subject 1974). Both reports are quite exhaustive and still relevant. Another member commented that in regard to 36-314 (2) (b) there should be a reporting system to the inspection department where reading exceed design parameters.

**Subcommittee Recommendation:** As written in the first round, add new Rules 36-313 and 36-314 along with the accompanying Appendix B notes for Rules 36-313 and 36-314.

**Chair's Comments (Third Round):** At the 109<sup>th</sup> meeting of the CEC Part 1 Committee (June, 2004) there was strong opposition to the subcommittee recommendation based on the non-explicit nature of the Rules proposed in the CEA report on the subject. In other words the design standards proposed do not fit in the context of inspection code rules. These standards would be better suited for an object based industrial code. As such, the Chair sees no practical way to convert these design standards into a list of explicit rules suitable for the CEC Part 1. Therefore, the Chair suggests the subject be dealt with by simply adding the following sentence to the Appendix B note for Rule 36-302 (2): " For the interconnection or separation of ground systems, design information may be found in CEA Report 249 D 542, Interconnection of Grounds Between Stations and Plants."

**Subcommittee Deliberations (Third Round):** Four subcommittee members responded to the Chair's suggestion. Three were in agreement and one agreed with comments. The comment was that the Appendix B note should be referenced to Rule 36-302(1) and a deviation is normally not requested and should not be required to interconnect station and plant grounds. Based on this, the Chair acknowledges that there is a need to provide a Appendix B reference for CEA Report 249 D 542 in order to preserve awareness of this useful information for situations where station and plant ground systems should be separated for safety reasons. The questions remains where to locate the reference.

**Subcommittee Recommendation:** On behalf of the Subcommittee, the Chair recommends with minor editorial changes, adding the following sentence to Appendix B Note for Rule 36-302(2): "Useful design information on the interconnection or separation of ground systems may be found in CEA Report 249 D 542, Interconnection of Grounds Between Stations and Plants."