

Bulletin 10-14-11
Equipotential bonding of non-electrical equipment
Rules 10-700, 10-702, 10-706 and 10-708

Issued May 2025
Supersedes Bulletin 10-14-10

Scope

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1) Introduction

The intent of this bulletin is to clarify how to comply with the Ontario Electrical Safety Code (OESC) requirements when a building with electric power contains metal gas piping.

Complying with the OESC may not necessarily meet all the requirements of The Technical Standards & Safety Authority (TSSA) - Gaseous Fuels Regulation (O. Reg. 212/01). Persons performing gas installations are reminded to consult with all other authorities having jurisdictions, including TSSA, to ensure all other codes and regulation requirements are met.

2) Equipotential bonding of metal gas piping (includes natural gas & propane piping) to comply with OESC

a) Intent of equipotential bonding for metal gas piping systems

Rule 10-700 c) requires that metal gas piping of a building supplied with electric power to be made equipotential (the state in which conductive parts are at a substantially equal electric potential) to non-current carrying conductive parts of electrical equipment. This bonding requirement applies to both natural gas and propane gas installations.

Where electrical wiring is present in the areas in which gas piping is installed, there is a possibility that the gas piping system, or appliance may become energized. Gas appliances, such as fireplaces and furnaces, may have electrical wiring installed right in the unit and in close proximity to the gas piping.

The intent of equipotential bonding of metal gas piping systems (Rule 10-700 c)) is to minimize hazards such as:

- incidental contacts between metal gas piping and energized electrical circuits,

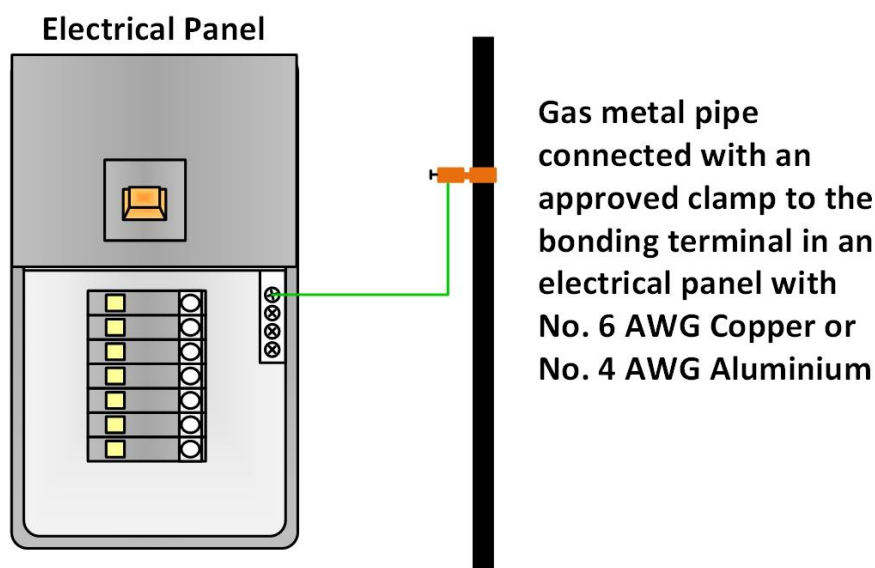
- accumulation of static charges, and
- stray currents and potential differences between various sections of piping and electrical equipment.

b) Means of equipotential bonding

Rule 10-708 1) requires an equipotential bonding conductor between the gas piping system and electrical equipment to be a minimum of No. 6 AWG copper or a No. 4 AWG aluminum conductor when installed as exposed wiring where is not subject to mechanical damage, with approved clamps suitable for the conductor size and type when run as open wiring (Diagram B1).

When run as concealed wiring or provided with mechanical protection, Rule 10-708 2) permits the use of No. 10 AWG copper or No. 8 AWG aluminum.

Diagram B1 – Approved pipe clamp with a bonding conductor connected to a bonding bar in an electrical panel



Notes:

1. Rule 10-706 requires bonding connections to be mechanically secured.
2. Metal gas piping systems shall also be considered equipotential with electrical equipment when threaded into a gas-fired appliance with an electrical supply that contains a bonding conductor (Diagram B2)
3. Care should be taken not to have aluminum bonding conductors in contact with copper piping.

Diagram B2 – Gas piping equipotential with electrical equipment via electrical supply conductors

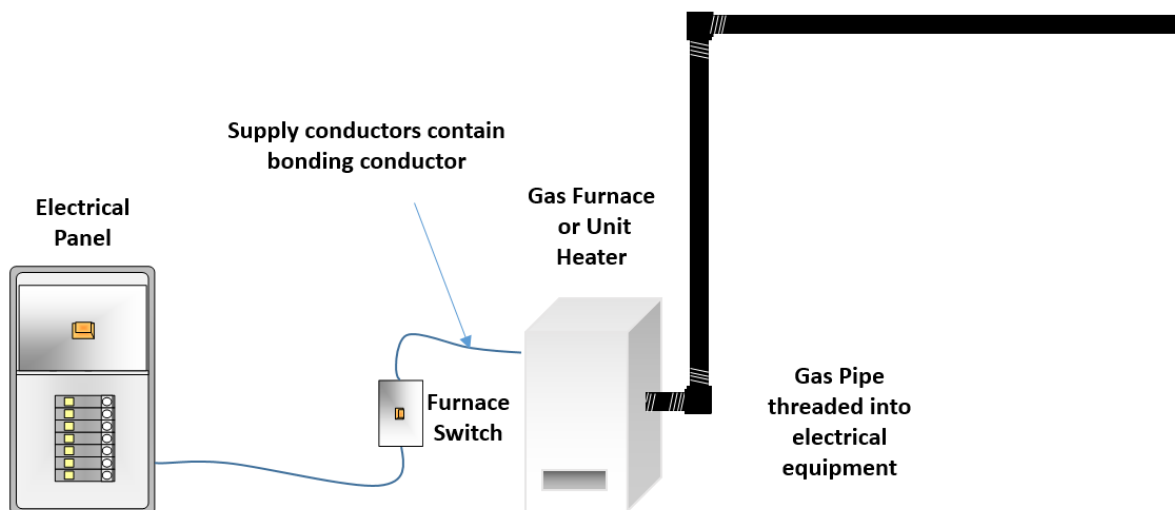
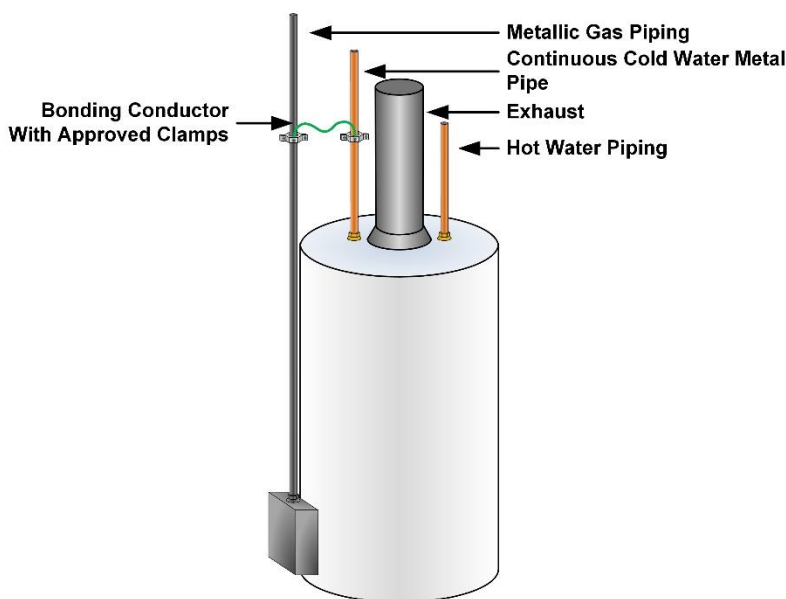


Diagram B3 – Bonding at the hot water tank



c) Corrugated Stainless Steel Tubing (CSST) installations

ESA has received inquiries from the Gas industry about jurisdiction regarding CSST installation and inspection. The below information is intended to clarify responsibilities regarding CSST installation.

CSST is a product used by the gas industry and falls under the requirements of B149.1 “Natural Gas and Propane Installation Code”. Therefore, ESA is not the authority having jurisdiction looking after its installation or inspection.

CSST has different characteristics than metal gas piping. With CSST, there is increased risk of damage to the tubing from lightning strikes or improper grounding clamping methods, potentially causing a gas leak leading to a fire or explosion.

The installation of CSST is the responsibility of a person authorized to do such work in accordance with Ontario Regulation 215/01 (Fuel Industry Certificates) made under the Technical Standards and Safety Act, 2000

CSST is required to be grounded (direct-bonded) for lightning protection in accordance with TSSA requirements and manufacturer installation instructions. This requirement will also achieve equipotential bonding.

The installation of CSST including the bonding, lightning protection, etc. is:

- executed by a person competent and qualified to perform such work, as required by TSSA; and
- required to meet the manufacturer’s installation instruction as per Ontario Regulation 212/01 (Gaseous Fuels)

Question 1

Does Rule 10-700 c) of the OESC require metal gas piping sections that are interconnected by CSST, to be bonded together with a bonding jumper?

Answer 1

No.

Rationale 1

Safety is achieved by TSSA/manufacturer installation instruction requirements.

d) Use of ground plate to achieve bonding for metal gas piping

Question 2

Does the installation of a new ground electrode connected to the gas system meet the bonding requirements of Rule 10-700?

Answer 2:

No. Rule 10-700 requires the metal gas piping in a building with electrical power to be made equipotential to the “system” grounding conductor, not to a separate isolated ground electrode.

Rationale 2

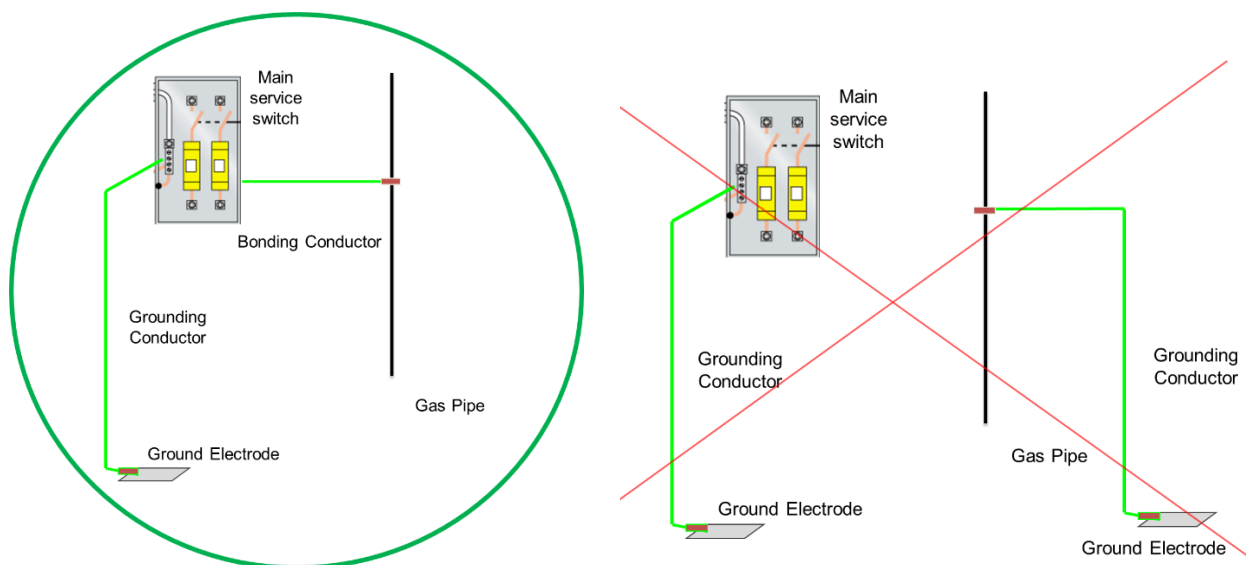
The intent of this rule is to make all gas piping equipotential (at the same voltage) as the metallic parts of the electrical “system” within the building. A stand-alone electrode not connected to the building’s electrical system does not accomplish this task and may put the gas piping at a different voltage than the building’s electrical system. To prevent

this difference in potential (voltage), when multiple electrodes are installed at a building, Rule 10-702 requires grounding electrodes to be interconnected with a No. 6 AWG copper conductor or in some cases a No. 4 aluminum conductor. See Diagram B4 for example.

Photo B1 - Example of gas line bonded to a separate ground rod



Diagram B4 – Compliant vs. Non-compliant bonding of gas line



The Ontario Gas Utilization Code, 6.14.6 of the B149.1, does not permit underground gas piping to “be used for an electrical ground (i.e. grounding electrode). Grounding electrode(s) must be installed as per Rule 10-102 for electrical system grounding.

Where there is a replacement or upgrade of an electrical service or grounding within a building containing a gas piping system not bonded to ground, as required by Rule 10-700 it is the responsibility the building owner to ensure compliance with the OESC.

3) Equipotential bonding of metal wastewater piping

Rule 10-700 b) requires that continuous metal wastewater piping of a building supplied with electric power to be made equipotential to non-current carrying conductive parts of electrical equipment.

The section of the metal wastewater piping that shall be bonded is the section that is in contact with the earth. For the purposes of the Rule, that will be considered a continuous system. Once there is an insulating section, or an insulating type coupling, the portion beyond need not be bonded to the electrical ground and will not be considered part of the continuous drain system.

The routing and use of the drain is more important than the length. The major concern in the Rule is voltage differences. A length of drain, which is continuous from where it contacts a remote ground, is of more concern than a length which is isolated at some point and then continues for some distance. The latter has no ground reference and can transfer no potential, the former can.