

# ELECTRICAL INSPECTION BULLETIN

**B-04-024**

## **Size of Neutral Conductor**



*(Effective 2015/12/01)*

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Nova Scotia Power has received an increasing number of requests to accept electrical installations incorporating a neutral conductor having an ampacity less than the ampacity of the circuit phase conductors. CEC Rule 4-024 provides for the installation of reduced neutrals provided that certain criteria can be met. The practice of installing reduced neutrals may realize significant initial cost savings; however, if not sized properly, may result in excessive maintenance and shutdown costs.

Non-linear electrical loads such as may be encountered with electronic business machines, computers, electronic ballast and the like, may present unexpected problems in the form of transformer failure, and overheating of neutral conductors. The main concern is the harmonic currents which are generated by the diode charging capacitors forming part of this type of equipment.

The C.E. Code is not specific on how to calculate unbalanced loads of this type. Rule 4-024 (2) (a) does, however, note that no reduction may be made in the neutral for that portion of the load which consists of electric discharge lighting. Until such time, specific rules are provided for non-linear loads, contractors, consultants, etc., shall be responsible to ensure that the ampacity of the neutral is adequate to accommodate the load being supplied.

Nova Scotia Power Inspection Authority shall interpret Rule 4-024 as follows:

### **General:**

Where reduced neutral are permitted, the minimum allowable size neutral conductor shall have sufficient ampacity to carry the maximum unbalanced load (4-024(1) and (2)) and shall not be smaller than the size of the service grounding conductor Rule 4-024(3)(b).

### Single-Family Dwelling

Reduced neutral may be permitted for single-family dwellings where the service capacity is greater than 100 amp, 120/240 volts, single phase, 3-wire and the dwelling has a significant phase to phase (240V electric heat) load. The minimum size neutral conductor shall have an ampacity not less than 100 amp (#3cu or #2AL).

Incandescent lighting, motors, heating loads are linear (constant impedance) in nature and harmonics are not normally a concern.