

Bulletin 8-6-0
Voltage drop in single dwelling units
Rule 8-102

Issued April 2014

Scope

- (1) Background
- (2) Application of voltage drop for branch circuits in single dwelling units
 - a) Determination of maximum allowable circuit conductor length
 - b) Location of “Supply side of the consumer service”
 - c) Wiring lighting and general purpose circuits with different wire sizes
 - d) Demand load and voltage drop

(1) Background

Rule 8-102 of the Ontario Electrical Safety Code sets out the maximum voltage drop limits on all types of electrical installations including residential.

Recently, a Director Order had been issued to add a new Subrule (3) to Rule 8-102. New Subrule (3) states that wiring for **lighting and general use** branch circuits in **single dwelling** units with the conductor length measured from the supply side of the consumer’s service to the furthest point of utilization in accordance with the values in Table 106 are acceptable. The maximum conductor lengths are determined based on a typical distributed residential load on lighting and general purpose branch circuits.

Single dwelling units consist of a detached house, one unit of row housing (including back-to-back townhouses and/or stacked townhouses), or one unit of a semi-detached, duplex triplex or quadruplex house. It does not include apartment buildings or condominiums.

This Director’s Order was issued on November 5th, 2013. It will be effective for enforcement on February 3rd, 2014.

If the project’s application for inspection or plan submission is made on or prior to February 2nd, 2014, the new Rule requirement will not apply.

This bulletin is addressing the application of the Rule for the most typical installations.

(2) Application of voltage drop for branch circuits in single dwelling units

(a) Maximum allowable circuit conductor length for lighting and general use branch circuits in single dwelling

New Table 106 provides maximum allowable conductor lengths for lighting and general purpose branch circuits in single dwelling units.

Table 106

Maximum conductor length (metre) measured from the supply side of the consumer’s service to the furthest point of utilization on a circuit using 90°C rated copper conductor at 30°C ambient temperature for 120V single phase ac circuits (2 wire circuits)

Size AWG (Cu)	Overcurrent Protection Rating/Setting	
	15 A	20A
	Maximum conductor length in meters	
14	38	-
12	60	50
10	96	78

Rule 8-102 requires these specified maximum lengths to be measured from the supply side of the consumer's service.

(b) Location of "Supply side of the Consumer's Service"

In single dwellings, the meter base is considered as the supply connection (demarcation) point when determining voltage drop for feeders and branch circuits within the dwelling unit.

Where the consumer's distribution panel is located remote from the meter base, the voltage drop in the feeder between them need to be considered. Rule 8-102 shall be applied to both the feeder and the branch circuits. The voltage drop in either the feeder from the meter base to the panel or a branch circuit from the panel to furthest outlet on the circuit cannot exceed 3% and the total voltage drop of the two portions combined cannot exceed 5%, as shown on Diagrams B1 and B2.

Diagram B1 - Where the consumer's distribution panel is located remote from the meter base

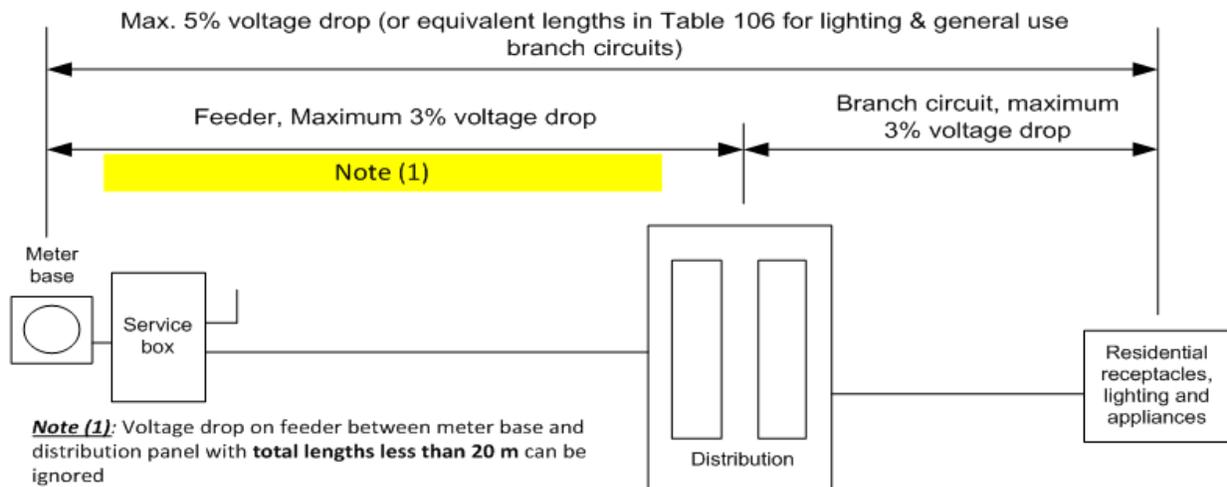
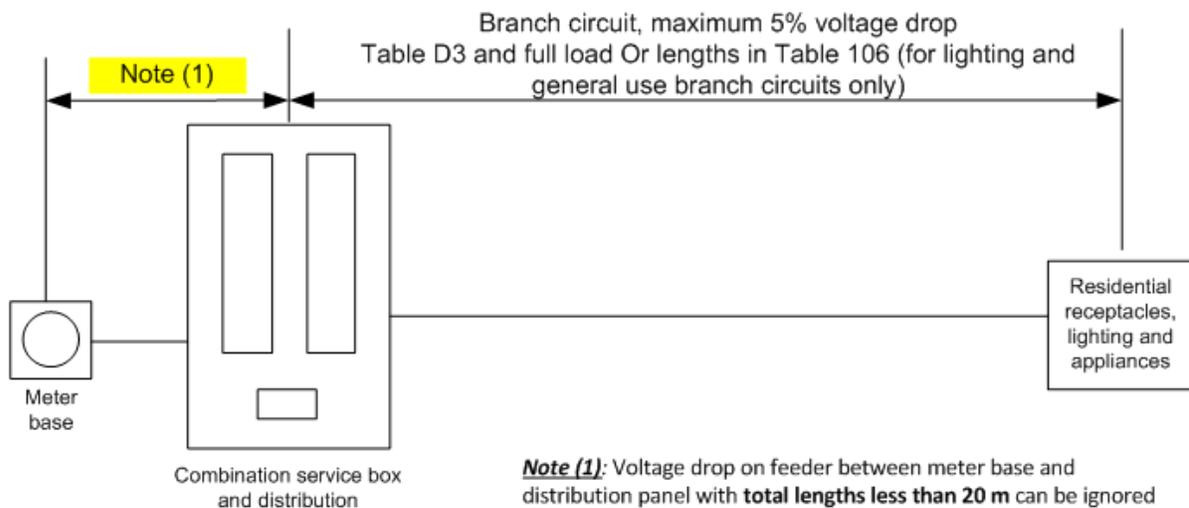
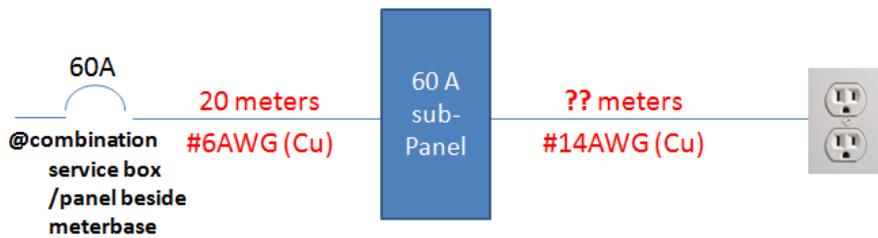


Diagram B2 – Combination service panel



Example-1:



Distance from sub-panel to the general purpose outlet is 38 m

Answer-1: As the main combination panel is beside the meterbase, and the distance from the combination panel to the sub-panel is 20 m, then lengths in Table 106 can be applied directly to branch circuits from the sub-panel

(c) Wiring lighting and general purpose circuits with different wire sizes

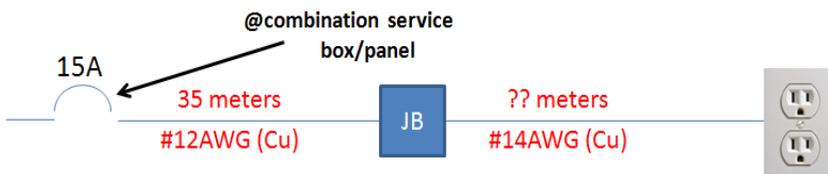
In some cases, conductors for branch circuits originate from the main consumer's service panel with larger size conductor, and tapped-off to smaller size to feed utilization outlets.

Example for that scenario is the wiring of lighting or a general purpose branch circuit with #12AWG to a junction box, then tap-off from that junction box with #14AWG to outlets on the circuit. In such cases, and to facilitate complying with the maximum permitted lengths provided in Table 106, the tables below provide guidance to the maximum permitted length with a smaller conductor

Table B1 – Conductor maximum lengths (meter) for lighting and general purpose branch circuits with different wire sizes

Length of #12AWG (Cu)	#14 AWG Protected by 15A OC	Length of #10AWG (Cu)	#12 AWG Protected by 20A OC	Length of #10AWG (Cu)	#14 AWG Protected by 15A OC
5	34.9	5	46.9	5	36.0
10	31.7	10	43.7	10	34.0
15	28.6	15	40.6	15	32.1
20	25.4	20	37.4	20	30.1
25	22.3	25	34.3	25	28.1
30	19.1	30	31.1	30	26.1
35	16.0	35	28.0	35	24.2
40	12.9	40	24.8	40	22.2

Example -2



Answer-2: From Table B1 above, the maximum distance from the junction box to the outlet with #14AWG is **16** meter

(d) Demand load and voltage drop

New Subrule 8-102(3) and Table 106 are not applicable to the following:

- Household appliances (such as a refrigerator, washing machine, central vacuum, and other receptacles as per Rule 26-720);
- Kitchen receptacles (Rule 26-722(b) and (e));
- Outdoor receptacles (Rule 26-714(a));
- Electrical heating and cooking appliances (Rule 26-744); and
- Other receptacles installed in single dwellings as per Section 24 (patient care and medical equipment).

For these branch circuits, Rule 8-102 and Table D3 as set out under the OESC are applicable; based on either a known connected load or one load equal to 80% of the rating on the over-current device.

As explained above in item (b) of this bulletin, for applications where distance between meter base and distribution panel < 20 m, a max. of 5% voltage drop is permitted to be applied for branch circuits.

Table B2 - Maximum conductor length (metre) for 120V branch circuits, as obtained from Table D3 for 80% loading at the end of the circuit and 5% Voltage Drop

Size AWG (Cu)	Overcurrent Protection Setting/Rating				
	15A	20A	25A	30A	40A
	Maximum conductor length in meters				
14	24.5				
12	39.0	30.5			
10	62.0	48.5	39.0	31.0	

Example 3: A 15 amp branch circuit and receptacle supplies a fridge that draws 8.0 amps (known load),



Example 4: A 20 amp branch circuit supplies kitchen counter T-slot receptacle, the load is unknown.

