

1 Q. **Reference: Application, v. 2, Jean Lake Terminal Station, Att. 1, page 9 of 25 (484 pdf)**

2 Citation:

3 This operating instruction is based on the ANSI / IEEE C57.92–1981 “American  
4 National Standard—Guide for Loading Mineral-Oil-Immersed Power  
5 Transformers” and includes recommended overload capabilities, as summarized  
6 in Table 4. It is noted that these guidelines are based upon the transformer  
7 ratings at 30°C ambient temperature.

**Table 1: Power Transformer Loading Guidelines – General Emergency Ratings**

Allowable loading in pu of continuous ampere rating	
Peak Load Duration (hours)	Ambient Temperature <0°C
0.5	1.50
1	1.41
2	1.32
4	1.26
8	1.23
24	1.18

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- 9 a) Please confirm or correct our understanding that Table 4 provides the allowable loading, in  
10 relation to the transformer ratings at 30°C ambient temperature, for temperatures below  
11 0°C.
- 12 b) Please confirm that the lower the ambient temperature, the greater the allowable loading.
- 13 c) Please indicate the approximate ambient temperature that usually occurs during peak hours  
14 in Wabush.
- 15 d) Please provide a similar table, or Hydro’s best estimate of a similar table, for a) the  
16 temperature mentioned in the previous response, and b) ambient temperatures below -  
17 20°C.

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- 1    A.    **a)** Table 4 provides the permissible emergency transformer loading for ambient temperatures  
2           for temperatures below 0°C. The multiplier in Table 4 is a multiplier to be used for the  
3           nameplate 30°C ambient, 65°C rise rating. It is important to note that loading above the  
4           nameplate rating will cause loss of service life to the transformer insulation. Table 4, which  
5           is based on the American National Standards Institute (“ANSI”) IEEE C57.92-1981<sup>1</sup> standard,  
6           provides the maximum loading above the nameplate rating for a specified time period that  
7           will result in minimal loss of life.<sup>2</sup> The Newfoundland and Labrador System Operators  
8           operating instruction containing Table 4 was developed to permit emergency loading at low  
9           ambient temperatures. It is used in day-to-day operation to provide some operator  
10          flexibility in emergency situations when transformer overloading occurs under contingency  
11          during winter peak (low ambient temperatures) to maintain customer supply without risk of  
12          significant damage to winding insulation and premature failure of the unit.
- 13          **b)** Newfoundland and Labrador Hydro (“Hydro”) purchases transformers using the Canadian  
14          Standard CAN/CSA C88-M90.<sup>3</sup> This standard gives the transformer rating for transformers at  
15          25°C ambient and 65°C temperature rise. For ambient temperatures below 25°C, clause 3.5  
16          of CAN/CSA C88-M90 permits an increase in rating by 0.75% for every degree Celsius below  
17          25°C down to a minimum of 0°C ambient. This standard therefore forms the basis of the  
18          transformer rating used by Hydro’s Transmission Planning for the annual review process to  
19          identify the requirement for future transformation capacity. For non-industrial loads, the  
20          0°C ambient rating provides a capacity buffer until the capacity addition can be added to the  
21          capital budget process (one-year duration) followed by the procurement and installation  
22          process (greater than two-year duration). This approach permits Hydro to plan transformer  
23          capacity additions in a timely fashion. During this time frame, operators follow the  
24          emergency loading guidelines as outlined in the operating instruction described in part a),  
25          such that there is minimal sacrifice to the transformer expected life. As life expectancies of  
26          power transformers are not accurately known, overloading guidelines are conservative.
- 27          **c)** The approximate ambient temperature in Wabush during peak loading is -30°C.

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<sup>1</sup> *Guide for Loading Mineral-Oil-Immersed Power Transformers*, ANSI IEEE C57.92-1981.

<sup>2</sup> ANSI IEEE C57.92-1981 Guidelines provide loss-of-life expectancy based on the magnitude of the overload and the duration of the overload.

<sup>3</sup> *Power Transformers and Reactors*, CAN/CSA C88-M90.

- 1        **d)** Table 4 is applicable to both the temperature provided in part c), and for ambient
- 2        temperatures below -20°C as there is no additional incremental increase in rating permitted
- 3        once the ambient temperature is less than 0°C, as discussed in part b).