

A novel cooling solution for an intersection of a 2x2 duct bank with HV cables crossed by a steam pipe

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ABSTRACT

This paper presents the results of ampacity studies and proposes remedial actions for the situation where a steam pipe and several distribution cable circuits cross a duct bank with HV transmission cables. The studies involved application of a new solution of a gravitational water cooling system. The system is described in detail in the paper. Mathematical models for several possible solutions involving gravitational water cooling, taking the crossing geometry into account, were developed. Practical concerns of BC Hydro engineers with respect to safety and public utility regulations as well as to practicability of the proposed solution are also discussed in the paper.

KEYWORDS

Cable ampacity, gravitational water cooling, cable crossings.

INTRODUCTION

A 2X2-transmission duct-bank (TDB) intersects a steam pipe crossing in downtown Vancouver. This intersecting steam line, which was super-insulated (isn't this term reserved for e.g. supraconduction ?), is likely to pose some concern for long-term thermal performance of the transmission cable and appears to be thermally limiting for the cable corridor. The situation is aggravated by the fact that there is a distribution duct bank running in parallel to the transmission circuits for about 20 m in the vicinity of the steam pipe crossing and additional 3 distribution duct banks perpendicular to the transmission circuits about 7 m from the crossing. There is an urgent need to develop a solution to mitigate this "hot spot" and to enable the transmission cable to carry its rated current (1250A). The soil temperature measured directly under the steam pipe, at the depth of the proposed transmission duct bank prior to its installation ranged from 35°C to 45°C over a six-month period.

DESCRIPTION OF THE INSTALLATION

This section provides information on the transmission and distribution cables being examined and their installation conditions.

Cables

Figure 1 contains information about the 230 kV transmission cables and various distribution cables in this installation.

