



A Rockwell Automation Company

Enbridge Inc. Spearhead South Expansion - Arc Flash

The Client:

As a transporter of energy, Enbridge operates, in Canada and the U.S., the world's longest crude oil and liquids transportation system. Since it was incorporated in 1949, the company now owns and operates Enbridge Pipelines Inc. and has a 27% interest in Houston Based Enbridge Energy Partners, L.P. (the Partnership). The Partnership is Enbridge's primary means of expanding in the USA. The liquid pipeline systems now comprise approximately 8,000 kilometers (5,000 miles) of pipeline in Canada and approximately 5,600 kilometers (3,500 miles) of pipeline in the USA,

delivering approximately 2.2 million barrels per day in 2006. Enbridge has a growing involvement in natural gas transmission and midstream businesses, through the Alliance and Vector pipelines, New Brunswick distribution, and various other U.S. assets. As a distributor of energy, Enbridge owns and operates Canada's largest natural gas distribution company, Enbridge Gas Distribution, which provides gas to approximately 1.9 million industrial, commercial and residential customers.

The Requirement:

Among the deliverables of the project electrical studies, Enbridge US requested an arc flash analysis. Arc flash can result in severe injuries to individuals who are not adequately protected and who are exposed to arcing faults. An arcing fault occurs when an arc is drawn through air causing ionization of the air from plasma created from the extreme heating at the electrical fault. The plasma can be very hot, vaporizing in an explosion which can cause serious injuries and death. Weakened stabs of old equipment, dirty conditions leading to tracking, silver or tin whiskers, and human error are among some of the causes of arcing faults.

Personal protective equipment (PPE) is commonly worn by maintenance or service personnel in industrial installations. In some cases these workers are over-dressed for the task and are needlessly hampered in the execution of their work. In other cases workers are not adequately protected and run the risk of serious injury if a fault were to occur. Electrical system hazard and the level of protection required is not outwardly apparent or obvious. The same electrical equipment installed in one system will require more PPE than in another system because of the system's characteristics, including protection settings.

The Design Solution:

Based on the electrical models for protection and fault analysis, Arc Flash Studies were done for each station. In this project Power Tools for Windows (SKM Systems Analysis) was used at the client's request.

This study reported for each major electrical component the level of PPE required, the flash protection boundary, and the incident energy. The Arc Flash Study also reported the working distance, the limited approach, the restricted approach, the prohibited approach, and the shock hazard voltage. NFPA 70E, 2009 states that an electrical equipment label contains either the available incident energy or required level of PPE. While performing the arc flash

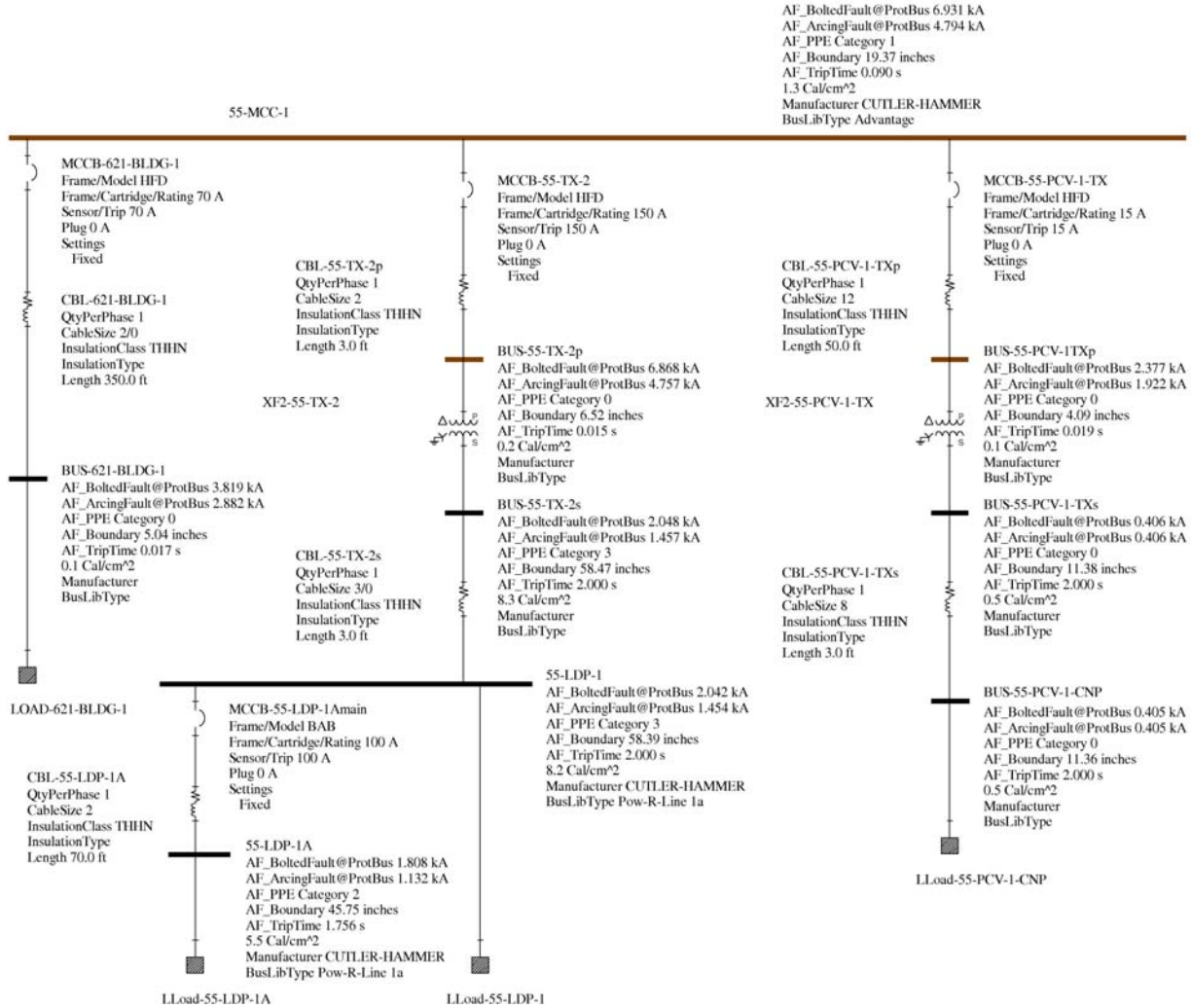
study in conjunction with a protection coordination study, experienced protection engineers can adjust the protection to reduce the incident energy, which may reduce the PPE required.

Article 110.16 in the 2008 NEC requires that: "switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that are in other than dwelling occupancies, and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards."



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Representative Sample Only

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www.hinz.com