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## Designing for Reliability of the TRIUMF Pneumatic Radioisotope Transfer System

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To illustrate TRIUMF design practices I will detail a project that I have undertaken to upgrade an underground pneumatic transfer system connecting a TRIUMF radioisotope lab to the UBC hospital 2.7 km away. In order to enhance our research program this system required an electrical, mechanical, and controls upgrade to provide isotopes to a second facility in addition to the hospital. It is important that the rabbit line works reliably as patients requiring PET scans can be very sick and highly immobile, making rescheduling difficult. Reliable radioisotope delivery is also necessary for time-sensitive research and to ensure that radiation safety is maintained. I will speak about the Product Development Process steps that I have used to design for reliability, emphasizing FMEA risk analysis with a focus on reliability and safety during the design review process. Additionally, I have heavily incorporated safe-guards against operator error into the control system. This human aspect must be addressed early in the process to minimize risk and must be uniquely addressed in a dynamic, operator-controlled system to ensure reliability.

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