

MINOS Elevator Surface Foyer ODH Analysis

T962

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(1.0) Introduction

This document presents the Minos Elevator Surface Foyer ODH A.alysis for a T962 argon vent pipe that will run through it. Since this foyer is part of the Minos Hall emergency route for fire safety, a number of conservative assumptions will be made in the analysis.

This analysis assumes no ventilation and an inexhaustible supply of argon to the vent pipe. Neither assumption is true. There is a significant amount of ventilation in the elevator foyer that is on diesel powered generator backup. During normal operation the only source of argon in the vent pipe will be a two type K sized compressed gas cylinders with a very small argon bleed into the vent pipe o prevent oxygen from permeating into the pipe.

It is also assumed that any argon leak that develops in the vent pipe will result in a fatality factor of 1.0. In reality the pressure driving argon gas out of any leak will be very small. The pressure vessel engineering note PPD10114 shows that for the worse case the internal pressure in the vent in this foyer will be 0.46 psig. The resulting release rate of argon into the foyer will be small as well be small as well.

(2.0) Basic Equipment Failure Rates

FESHM 5064.TA page 3, Table 1, Fermilab Equipment Failure Rate Estimates

Pfp = $1e-9^{**}(1/hr)$ (probability of pipe section failure)
Pfw = $3e-9^{**}(1/hr)$ (probability of weld failure)
Pfg = $3e-7^{**}(1/hr)$ (probability of gasket failure)

(3.0) Probability of Failed Piping Components

There are no valves on this section of piping. There is 20 ft of pipe in the surface foyer. FESHM 5064 lists failure rates of piping as per section of pipe. Generally pipes come in 20 ft sections.

SecArPipe = 1 (sections of argon piping)

Except for one joint, described below, all joints are welded. The number of welds on the argon piping system is:

NumArWelds = 8 (number of welds on argon piping)

There is one o-ring sealed joint in the vent pipe. This seal has been leak checked and found to be tight. A secondary seal consisting of Hilti FS-1 Firestop sealant now covers this joint. For this joint to leak, both seals have to fail. This joint is also behind a cinder block wall to protect it from mechanical damage. The failure probability of each of these seals is assumed to be that of a gasketed joint.

`NumArGasket = 1` (number of joints with seals)

The probability of a piping system failure is:

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Pfail = Pfp*SecArPipe+Pfw*NumArWelds+Pfg*Pfg*1**hr*NumArGasket
Pfail = 0.2500009e-7**(1/hr)
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(4.0) ODH Classification

Any argon leak into the foyer is assumed to have a fatality factor of 1.

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FF = 1.0**fatalities (fatality factor with no ventilation)
Phi = Pfail*FF
Phi = 0.2500009e-7**(fatalities/hr)
ODHclassification(Phi) = ODH Class 0
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The elevator foyer has an ODH 0 classification.