



Fermilab

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To: Pier Oddone or Director's Designee
From: Giorgio Apollinari - TD Head *Apollinari Giorgio*
Subject: Request for Director's exception for the 1.3 GHz Helium Vessel for
Cavity AES-4 (pressure vessel IND-138)

The vessel described in the attached engineering note is an exceptional vessel and requires a Director's exception for full compliance with FESHM Chapter 5031 (Pressure Vessels). The 1.3-GHz dressed cavity has materials and complex geometry that are not conducive to complete design and fabrication as a helium vessel following the ASME Boiler and Pressure Vessel Code.

Specific areas of exception to ASME code include:

1. The use of Nb and NbTi (not explicitly allowed by the code) and use of the enhanced material properties at cryogenic temperatures in the stress analysis.
2. Some welds in the Ti subassemblies welded from one side only, with no backing strip, justified by the need to avoid burning through the material and affecting the cavity.
3. No Ti weld was tested by liquid penetration and no electron beam weld was examined ultrasonically in its entire length.
4. Weld procedure specification (WPS), procedure qualification record (PQR), and welder performance qualification (WPQ) not performed, or initiated after completion of the work.
5. Use of a not Code-approved weld for the attachment of the 2-phase helium pipe to the vessel
6. Use of a low pressure venting system (15 psig) not recognized by the Code.

The project began in 2006 and the design of the Generation 3 (G3) Helium Vessel RF cavity assembly has been modified from the TESLA TTF design for a more efficient fabrication, being the result of collaboration between FNAL and INFN. We show that the vessel is safe at a level that is similar to the Code, as recommended by the DOE's Federal

Register for contractors on Worker Safety and Health Program (10CFR851) and in accordance with FESHM 5031.

With this memo, we request a signature from the Director or designee for this exceptional vessel engineering note.

Giorgio Apollinari