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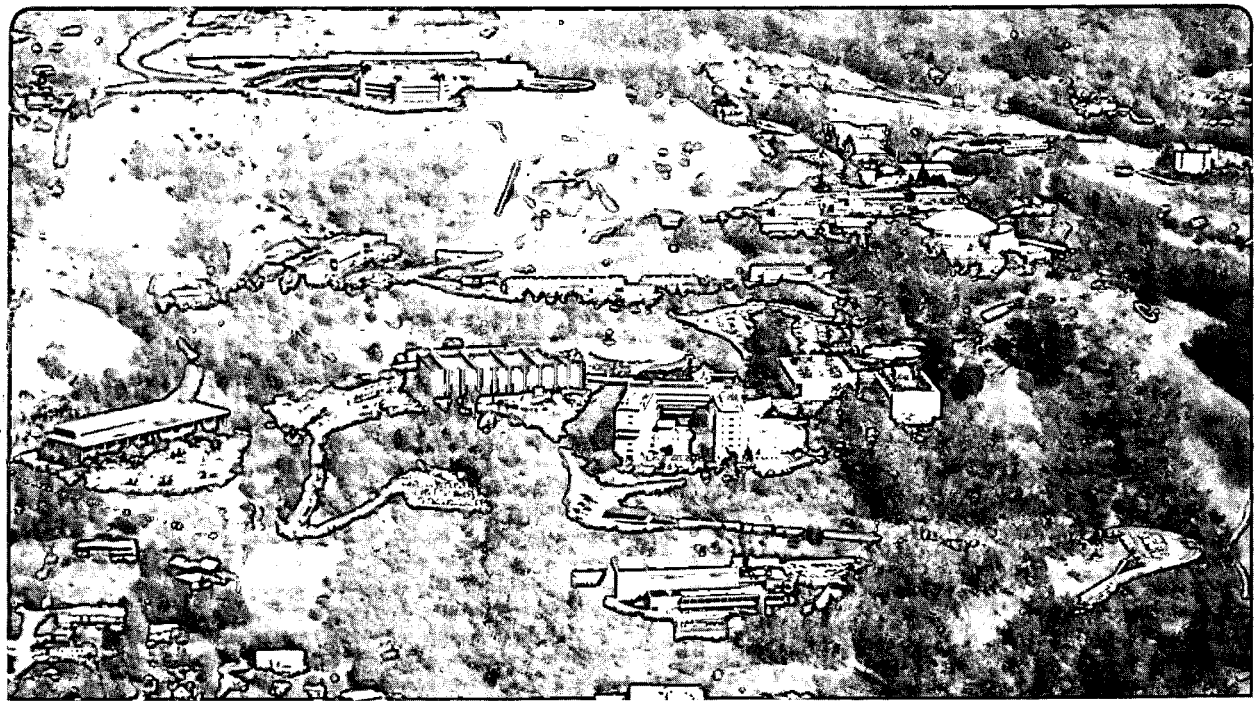

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MEMORANDUM

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FROM: Gene Miner G.M.

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ENGINEERING NOTE

CODE	SERIAL	PAGE
P40102	M5427	1 OF 3

AUTHOR	DEPARTMENT	LOCATION	DATE
Gene Miner	Mechanical Engineering	Berkeley	November 1979

PROGRAM — PROJECT — JOB

PEP-4

INTERNAL SYSTEMS INTEGRATION

TITLE

INSULATED GROUND BREAKS FOR PREAMP COOLING AND SOURCE ACTUATOR TUBES

I. REQUIREMENTS

A. Electrically insulate parallel ground circuits in order to avoid multiple grounds and ground loops.

B. Preserve pressure and vacuum integrity of the preamp cooling and source actuator circuits.

C. The ground breaks must occupy minimum space.

D. The ground breaks must permit field installation.

II. BACKGROUND

A. The time projection chamber preamplifiers and source actuators, the inner drift chamber preamplifiers, and the pole tip calorimeter preamplifiers are all inside the TPC pressure volume which normally operates at ten atmospheres pressure of clean 80% Argon-20% Methane gas.

B. The preamplifiers are all water cooled.

C. The source actuators are pneumatically operated.

D. Metal tubing was chosen for all internal fluid circuits.

1. Metal tubing has a longer useful lifetime than plastic or rubber tubing and is less vulnerable to damage.

2. Metal tubing will not contaminate the gas. Plastic or rubber tubing will contribute to contamination of the gas.

III. THE GROUND BREAK DESIGN

A. Two configurations were developed and tested.

1. The internal ground break design lends itself well to use inside the TPC pressure volume because it is rugged and requires little space.

a. The ground break consists of a tubular section of NEMA G-10 glued inside a stainless steel sleeve as shown on Drawings 19C9632, 19C9642, and 19C9652.

b. The ground break is glued over the end of a section of tubing and is installed in a Swagelok fitting as shown on Drawing 19C9663.

c. The glue between the tubular section of NEMA G-10 and the outside sleeve, and between the NEMA G-10 and the inside tube contributes to sealing and holds the parts in place until the Swagelok fitting is made up. It is not needed for mechanical strength. The swaging effect of the Swagelok fitting provides the mechanical strength of the assembly.

2. Because the internal ground break design includes coaxial conductors separated by a thin layer of insulation, it does not lend itself well to high voltage differences or to applications where it is exposed to high frequency electrical noise such as stray radio-frequency fields. The external ground break is designed for high voltage differences and will not pick up high frequency electrical noise.

a. The external ground break consists of a tubular section of NEMA G-10 glued outside a short stainless steel tube and inside a stainless steel sleeve at each end as shown on Drawings 20C1623, 20C1633 and 20C1643.

b. The external ground break is installed between two Swagelok fittings as shown on Drawing 20C1653.

IV. TESTING

A. Two .375-inch internal ground break assemblies were glued on each end of a .3125-inch O.D. x .035-inch wall copper tube (any metal tube will work) and were installed inside a pressure vessel using .375-inch Swagelok bulkhead fittings.

B. The vessel was sealed and vacuum tested.

C. The tube assembly was pressurized to 300 psig with the vessel at atmosphere.

D. The vessel was pressurized to 300 psig with the tube assembly at atmosphere.

E. The pressure in the tube assembly was cycled from 0 to 150 psig two hundred times with the vessel at atmosphere.

F. The tube assembly was vacuum tested with the vessel at atmosphere.

G. Both ground breaks were checked electrically with a volt-ohm meter for resistance between the tube and the fittings.

H. One fitting was disassembled and reassembled.

I. The tube assembly was vacuum tested.

J. This fitting was tightened further and vacuum tested again.

K. Steps H. and J. were repeated.

L. Step G. was then repeated.

M. Two .375-inch external ground breaks were installed between two Swagelok fittings and were tested per steps C. and E. through L. above.

N. All tests were performed by Bill Baldock of the Assembly Shop.

V. TEST RESULTS

A. The ground breaks sealed easily.

B. There was no evidence of leakage under vacuum.

C. There was no evidence of leakage under pressure.

D. There was no evidence of electrical leakage.

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