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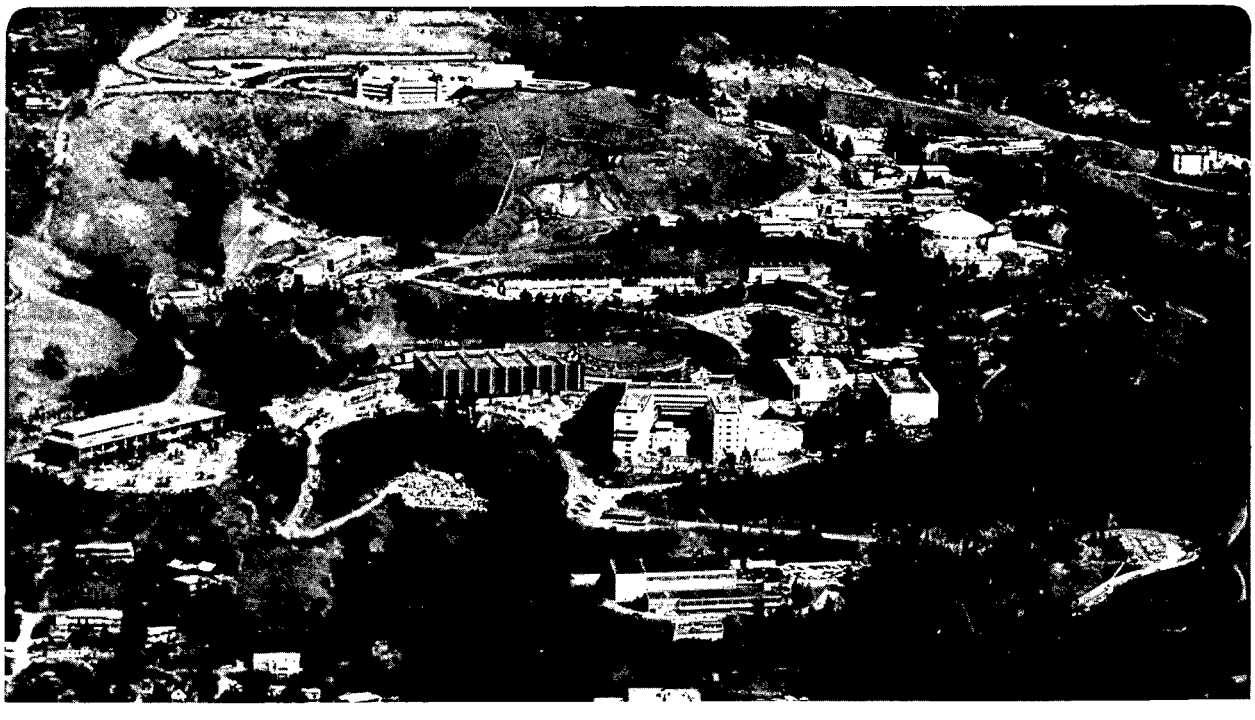


DISCLAIMER

LAWRENCE BERKELEY LABORATORY - UNIVERSITY OF CALIFORNIA ENGINEERING NOTE	CODE	SERIAL	PAGE
	D32221	M5131	1 OF 3
AUTHOR: RON HINTZ / DEPARTMENT: DOUBLET III	LOCATION: T77G	DATE: FEB 10, 1978	

ON DOUBLET III FOR GENERAL ATOMIC CO. WE ARE DESIGNING A LARGE ALUMINUM CYLINDRICAL VACUUM TANK WITH THE USUAL NUMBER OF WELDS, PORTS, AND O-RINGS.

WE PLAN ON SPECIFYING A MAXIMUM LEAK RATE OF 1×10^{-8} STD. CC/SEC AIR EQUIVALENT FOR OUTSIDE FABRICATION.

I ASKED GEORGE BARBERO OF THE ASSY. SHOP TO TEST SOME STOCK BUNA-N O-RINGS TO DETERMINE THE HELIUM PERMEATION RATE.

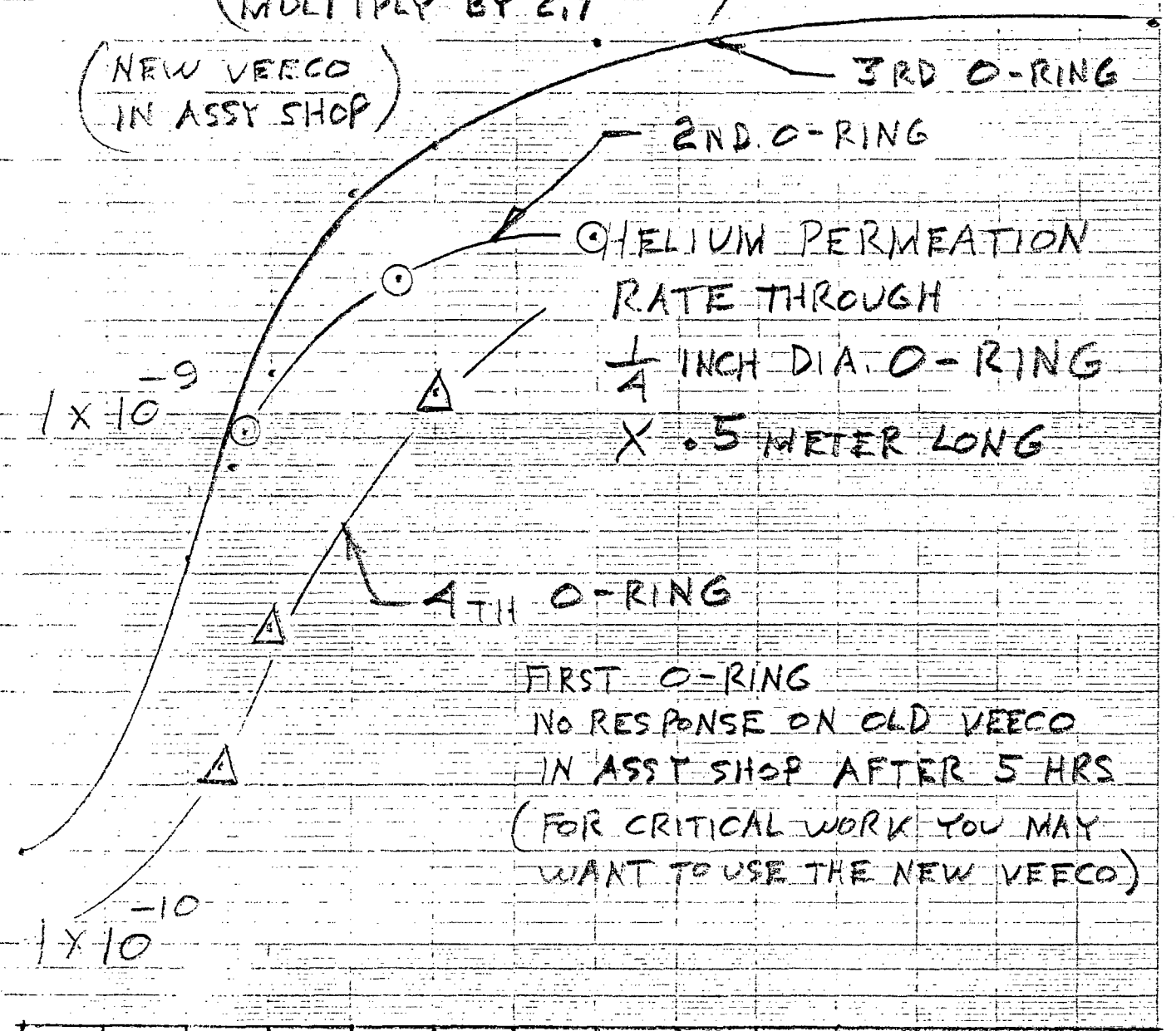
WE WANTED TO KNOW IF THIS PERMEATION IS APT TO CAUSE DIFFICULTY WITH THE LEAK RATE SPECIFICATION FOR THE WELDS.

FROM GEORGE'S DATA IT APPEARS THAT WE SHOULDN'T HAVE DIFFICULTY AS LONG AS THE O-RINGS ARE NOT SUBJECTED TO HELIUM FOR AN EXTENDED PERIOD OF TIME.

THE O-RINGS WERE LIGHTLY GREASED WITH DOW-CORNING SILICONE LUBRICANT 970V

1×10^{-8} STANDARD CC/SEC AIR EQUIV.

(FOR HELIUM FLOW RATE MULTIPLY BY 2.7



APPROX 1 ATM OF HELIUM ACROSS O-RING

4 SEPARATE O-RINGS WERE TESTED

RON HINTZ
FEB 10, 1978

REFERENCE INFO.

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The high sensitivity of tracer-gas detectors poses one particular problem. That is, there may be false leakage indications due to permeation through materials. Helium is a particularly difficult gas in this regard. The permeation of helium through a 1-inch-diameter O-ring is sufficient to produce a readily detectable helium pressure in the test volume. When probing with helium gas, care should be exercised to keep the helium from all O-rings in the system. After all other portions of the system have been leak checked, the individual O-ring seals may be checked. A permeation signal may be separated from a true leak by the rate of the signal response. The response of a true leak is related only to the system time constant if double-leak problems are ignored. Permeation signal response time is related to the time required for the establishment of a diffusion gradient through the material. A typical value of permeation response time for O-ring materials is about 1 hour. Therefore, if helium is applied to an O-ring, a quick response indicates a true leak, while a long-term buildup signifies permeation. The process of permeation is particularly obnoxious due to the fact that it possesses a long cleanup time. Once helium has penetrated through an O-ring, many hours of pumping will be required before the signal cleans up. The presence of only a few O-rings is enough to produce a signal which will completely saturate the leak detector. When large systems are bagged or hooded, it is advisable to isolate the O-rings from the helium atmosphere with a protective gas blanket or by some mechanical means of isolation.

FROM:

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VACUM TECHNOLOGY AND SPACE SIMULATION

Donald J. Santeler, et al

NASA SP-105

Aero Vac Corporation

1966

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