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## Recent Work

### Title

DOUBLET III FOR GENERAL ATOMIC COMPANY

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### Author

Hintz, R.

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AUTHOR	DEPARTMENT	LOCATION	DATE	
RON HINTZ	DOUBLET III	T77G	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  $1 \times 10^{-8}$  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

$1 \times 10^{-8}$

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2 OF 3

STANDARD CC/SEC AIR EQUIV.

(FOR HELIUM FLOW RATE  
MULTIPLY BY 2.7)

(NEW VEECO  
IN ASSY SHOP)

3RD O-RING

2ND O-RING

HELIUM PERMEATION  
RATE THROUGH

$\frac{1}{4}$  INCH DIA. O-RING

X .5 METER LONG

$1 \times 10^{-9}$

4TH O-RING

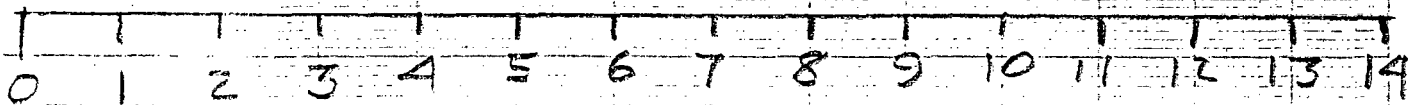
FIRST O-RING

NO RESPONSE ON OLD VEECO

IN ASSY SHOP AFTER 5 HRS

(FOR CRITICAL WORK YOU MAY  
WANT TO USE THE NEW VEECO)

$1 \times 10^{-10}$



HOURS →

APPROX 1 ATM OF HELIUM  
ACROSS O-RING

RON HINTZ  
FEB 10, 1978

4 SEPARATE O-RINGS  
WERE TESTED

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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:

N66-36129

VACUM TECHNOLOGY AND SPACE SIMULATION

Donald J. Santeler, et al

NASA SP-105

Aero Vac Corporation

1966

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LAWRENCE BERKELEY LABORATORY  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIFORNIA 94720