Attachment 9

SAFETY EVALUATIO'

- LEAKAGE AND CRITICAL AREA
- TUBE INTEGRITY
- CORROSION RATE
- OPERATING INTERVAL
- CONCLUSION

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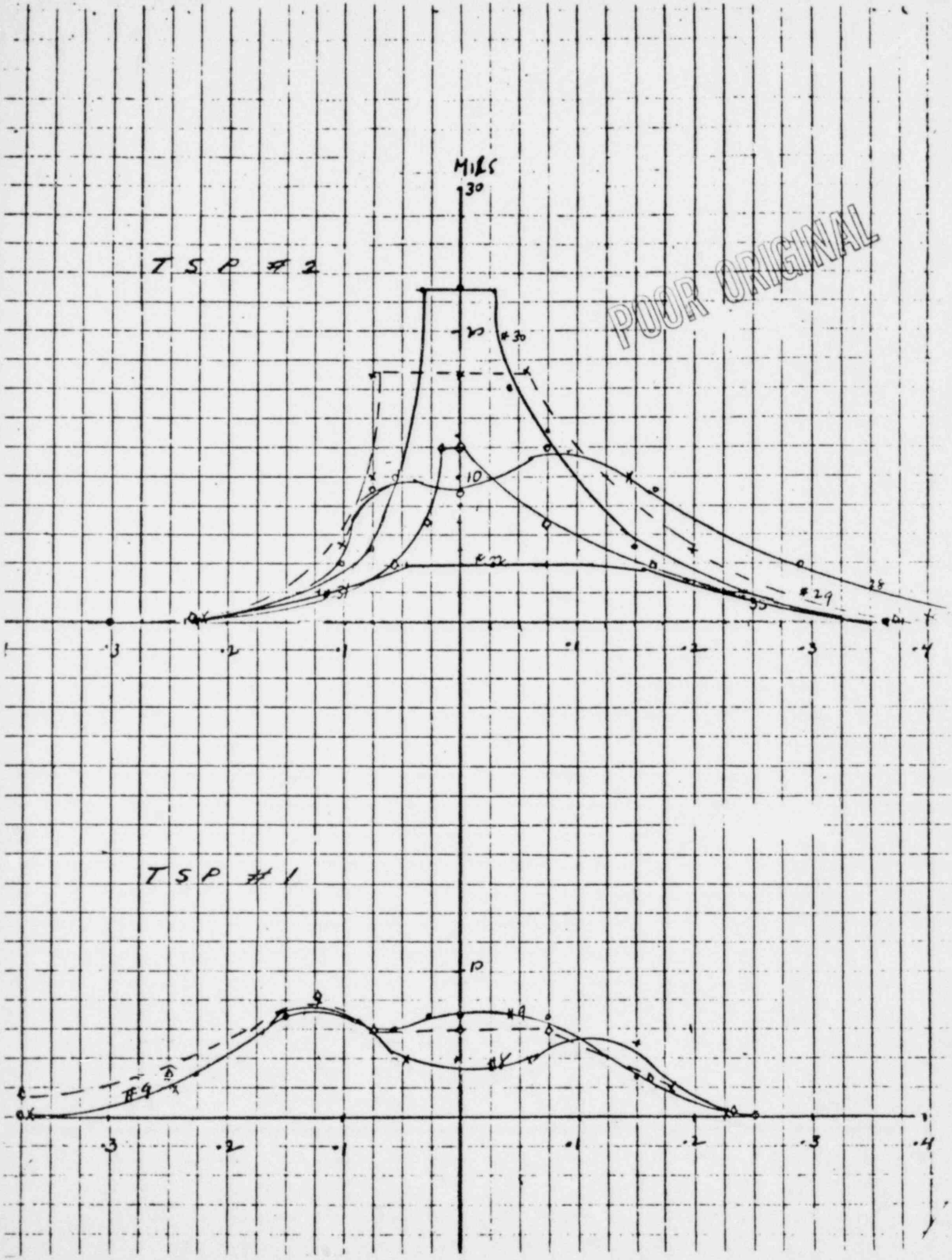
LEAKAGE AND CRITICAL AREA

- Definition of Leak
  - Normal Shutdown Procedures
  - No Safeguards Actuation
  - Nominal Leak Flow Area
    - 3/8 Inch Diameter Hole
    - Flow Area = .110 Sq. In.
  - Nominal Leak Flow
    - 125 GPM

- Profile of Corroded Areas on Prairie Island 2 R34 C79
  - TSP #2 Area .060 x .1875 = .011 Sq. In.
  - TSP #1 Area .24 x .1875 = .045 Sq. In.

- Leak Rate Vs. Burst Pressure



POOR ORIGINAL

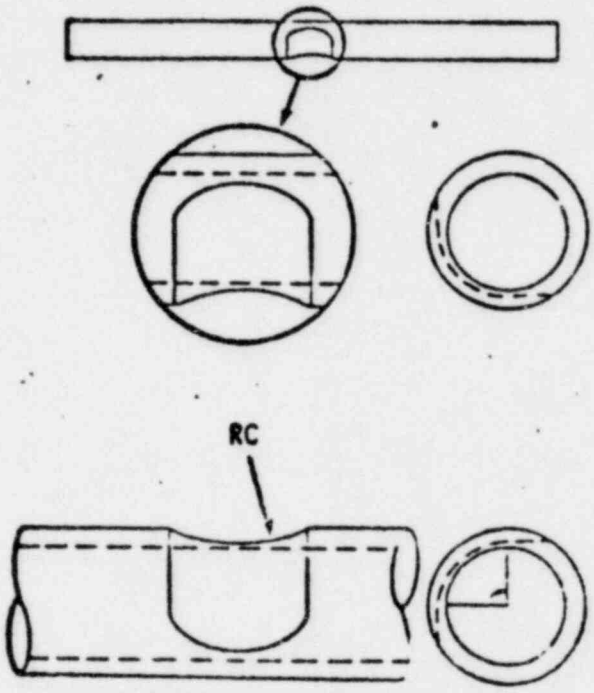
TUBE INTEGRITY

- Tube Wall Required
  - Normal .008
  - Faulted .013

- Tube Burst Data
  - Corrosion Profiles
  - Tube Burst Tests

GEOMETRY OF

ELLIPTICAL WASTAGE SPECIMEN



BURST PRESSURES FOR THREE HEATS OF 0.875 IN. X 0.050 IN. SPECIMENS

Defect Type	Heat B, 50 ksi Yield	Heat E, 44 ksi Yield	Heat F, 41 ksi Yield
Undefected	9260	9460	9180
	9275	9665	9450
	9440	9500	9240
Elliptical Wastage			
55 - 60%	5550	5635	5465
R_c = 12"	5635	5280	5700
Length = 1 ½"			
85 - 90%	2950		
R_c = 6"	2970		

Ref: NUREG/CR-0277, July 1978

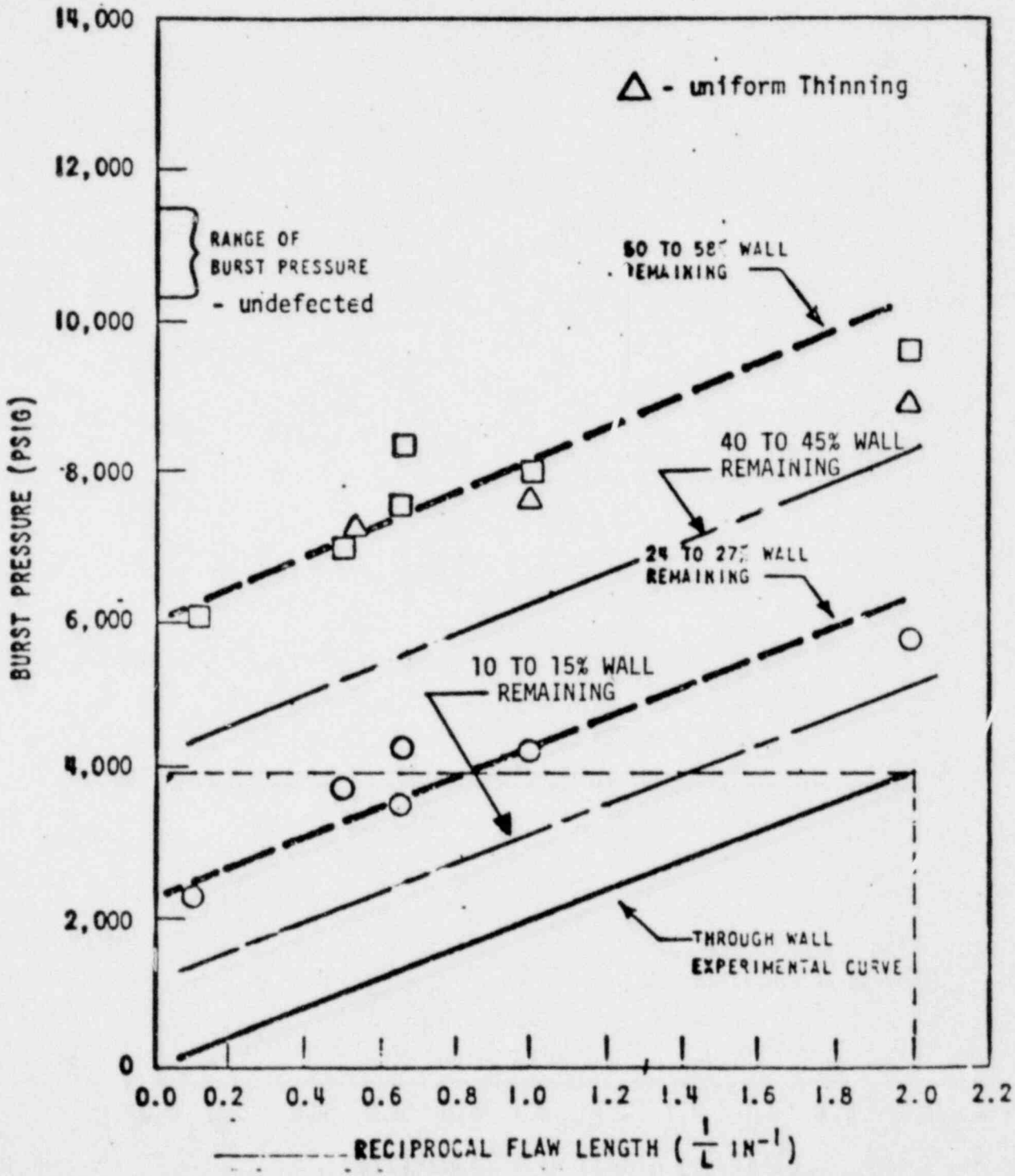


Figure 5. Room Temperature Burst Pressure of 7/8" Tubes with Machined Flats (Ref. WCAP-8429)

CORROSION RATE

- CORRODENT SOURCE
  - RESIN INTRUSION
  - CONDENSATE POLISHERS
- TUBE EXPOSURE TO CORRODENT
  - POLISHER AVAILABILITY 12/77
  - 24 MONTHS OPERATION
- TUBE CORROSION RATE
  - INDIVIDUAL LOCATION CORROSION RATE
  - LARGEST ECT INDICATION IN SERVICE IS 45%
  - CALCULATED CORROSION RATE OF 1.8% / MONTH

OPERATING INTERVAL

- REQUIRED MINIMUM TUBE WALL
  - 13 MILS = 26%
- LARGEST ECT INDICATION IN SERVICE
  - 45% = 55% REMAINING WALL
- CORROSION RATE 1.8% PER MONTH
- PERMISSIBLE OPERATING INTERVAL FOR MINIMUM TUBE WALL

$$\frac{\text{REMAINING WALL} - \text{REQUIRED WALL}}{\text{CORROSION RATE}} = 16 \text{ MONTHS OF OPERATION}$$

CONCLUSIONS

- ADEQUATE BURST PRESSURE IS MAINTAINED
- CORROSION RATE 1.8% PER MONTH
- OPERATING INTERVAL 16 MONTHS