



Figure 13.

Fracture pieces (6), (7), and (8) from side-wall area adjacent to bottom of cylinder shown in Figure 1.



Figure 14. Fracture fragments (9) through (18) whose location was not identifiable due to small size and fracture surface damage.

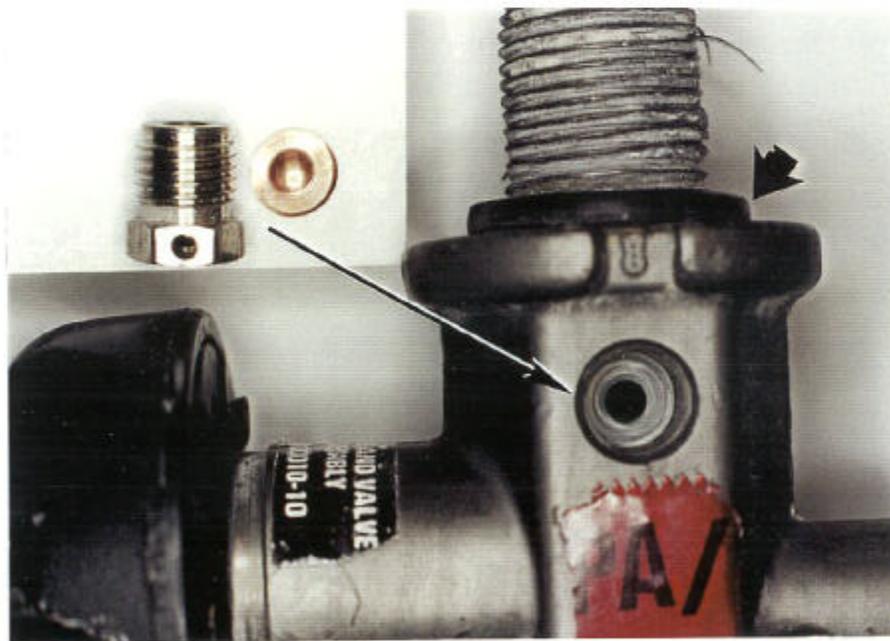


Figure 15. Valve from exploded cylinder showing "O" ring seal (arrow), deformed and several sheared threads, deformed copper rupture disk and retainer. Note white corrosion product on threads.



Figure 16.

Identification markings from heavy wall area at top of cylinder. Note ball peened area below the 11-89 Retester Identification Number.

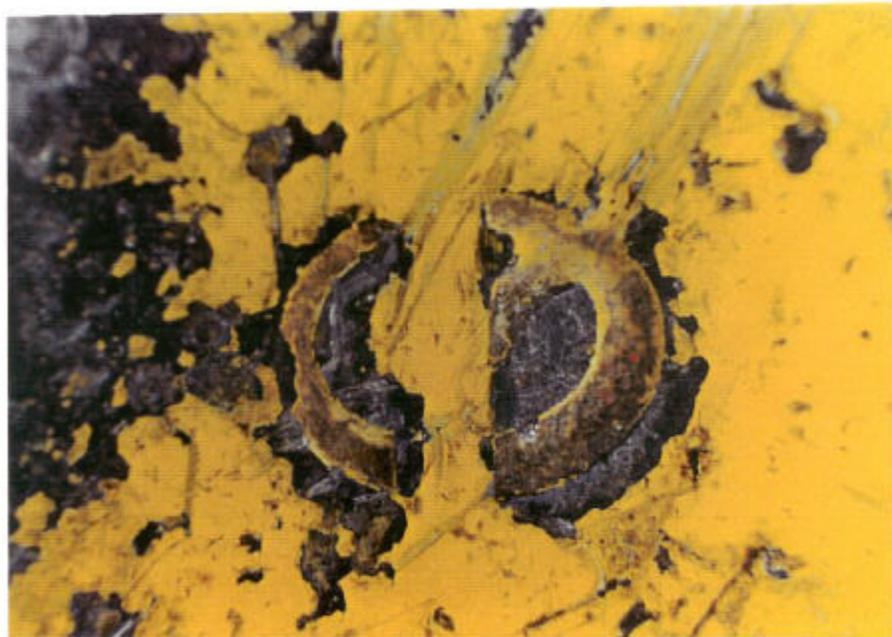


Figure 17.

Identification mark(s) on the bottom of the cylinder. The significance of letter "A" following "X59", the Lot Code, and the unrecognized symbol in the lower photograph is not known at this time.



Figure 18.

Enlarged views of the internal thread for receiving the valve revealing the as-received condition of fracture piece (2) at top left, fracture piece (4) at top right, and fracture piece (1I) at lower left. Note the additional cracks in the interior neck area and the more corroded area of the fourth thread from the bottom.

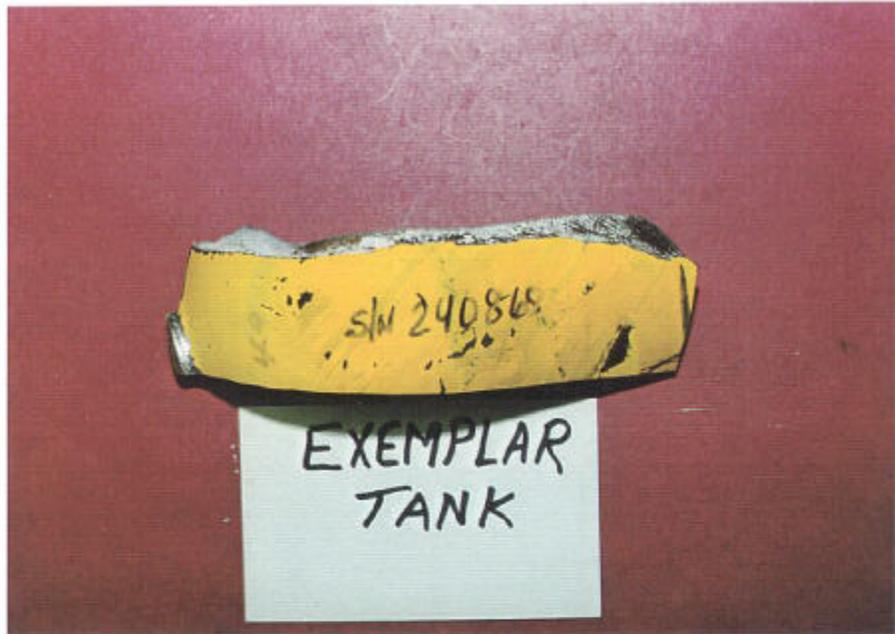


Figure 19.

Fracture specimen from an exemplar cylinder (S/N 240868) from Lot Code X59 that was over-pressurized in excess to the design burst pressure.



Figure 20. A macro view of the fracture surface #1 which was examined to characterize the fracture features. Areas indicated by arrowed numbers were examined at higher magnifications under the SEM.

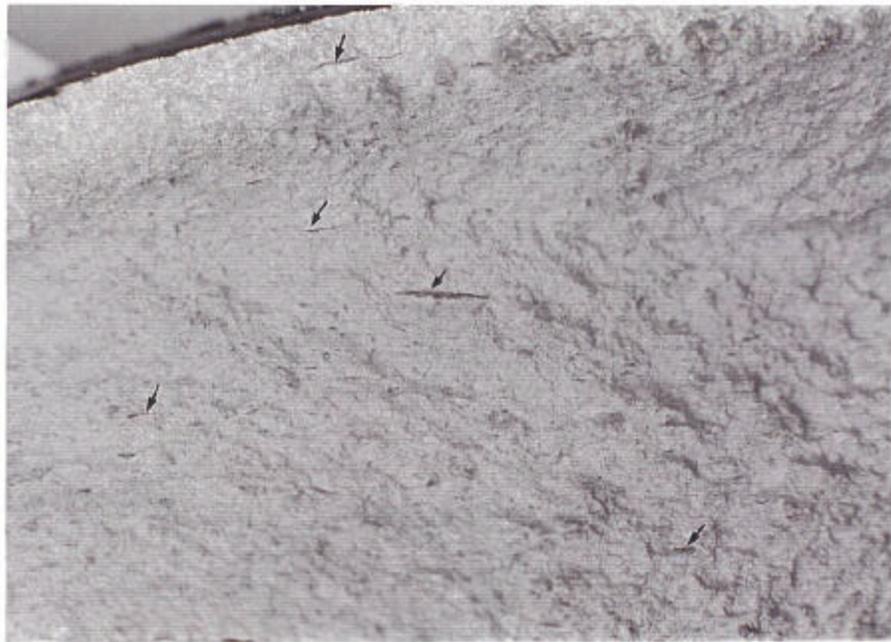
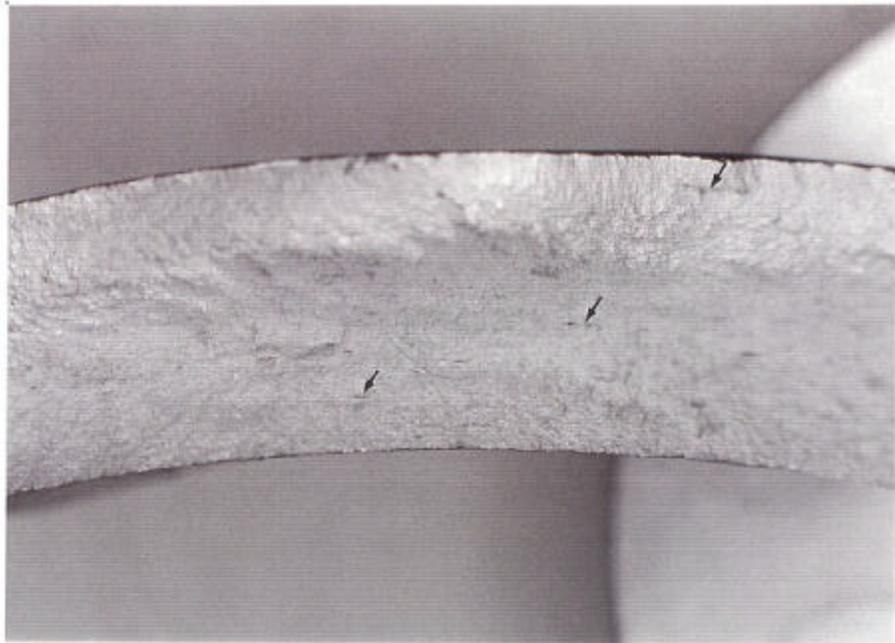


Figure 21. Enlarged photographs of the fracture surface show a large population of dark streaks.

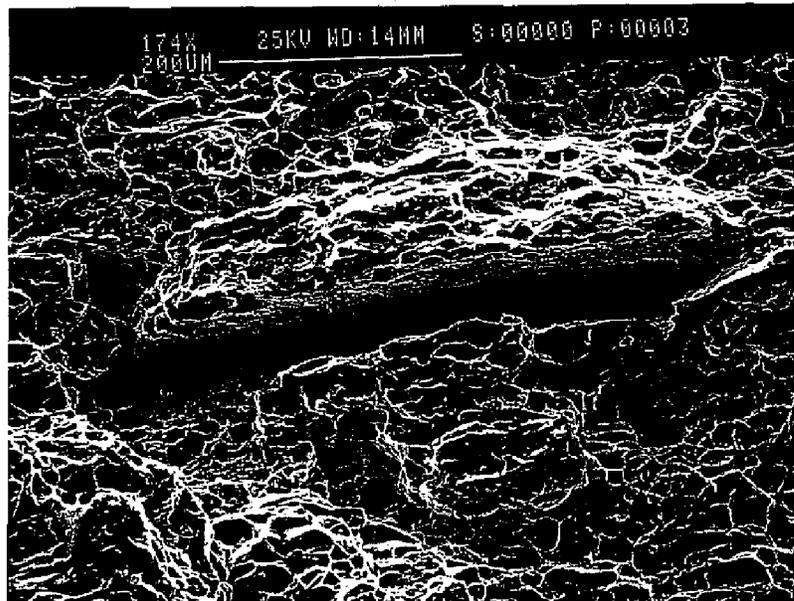


Figure 22.

SEM micrograph shows a high magnification view of dark streaks indicated in figure 21. It appears like voids having textured/rough surfaces; X174.

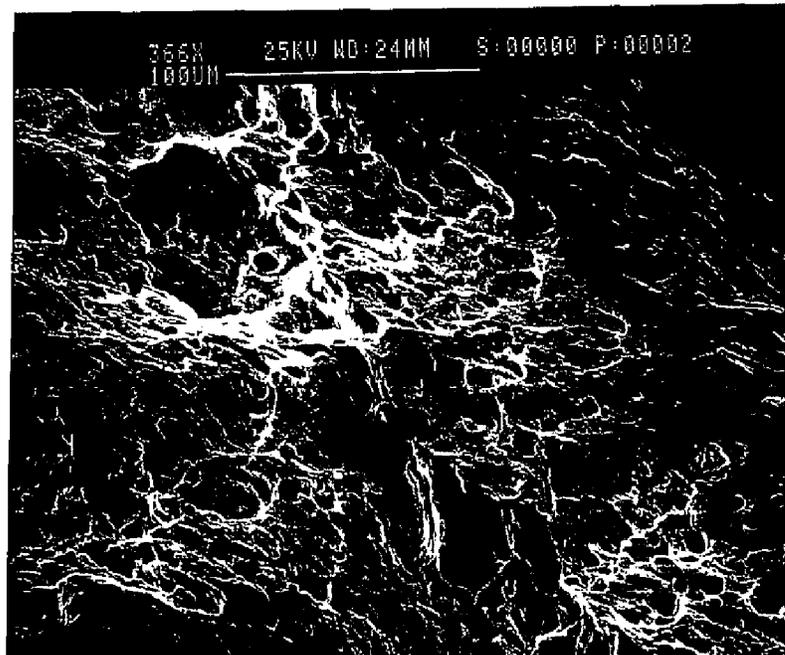


Figure 23.

SEM fractograph, from location #1 in Figure 20, exhibits fracture initiating at threads. The failure occurred in tearing mode due to overload, indicated by elongated dimples; X366.

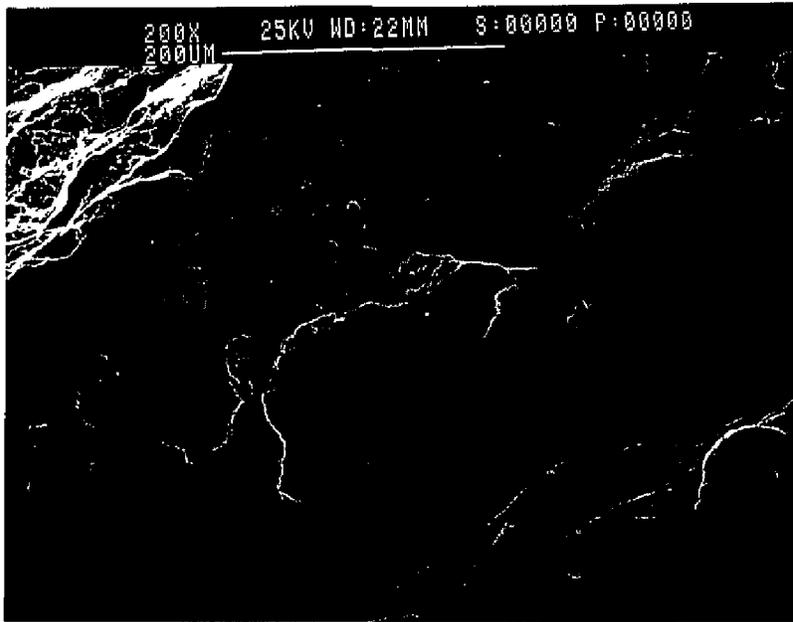


Figure 24. Fracture appearance at location #2 is mostly featureless. Some evidence of overload dimples is also indicated; X200.

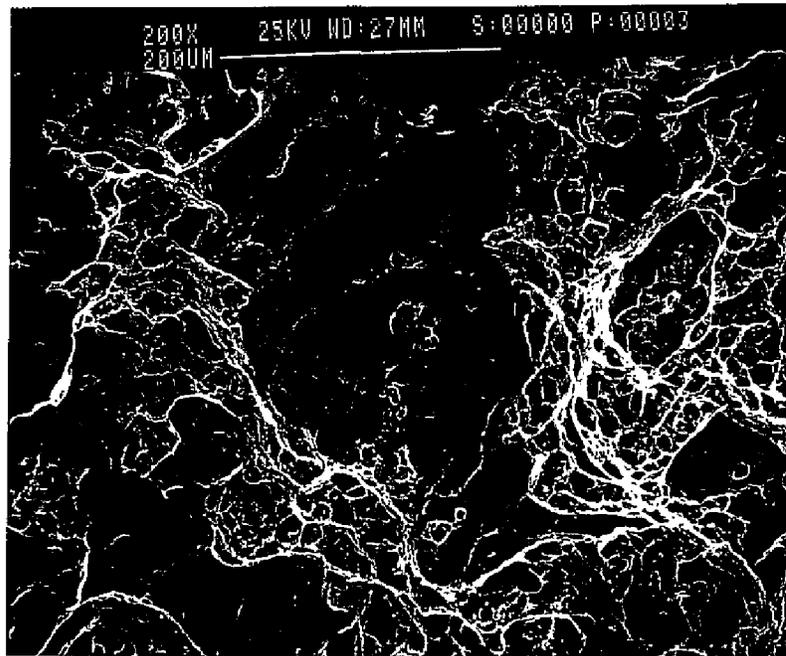


Figure 25. Fractograph from location #3 shows similar features as in Figure 24; X200.

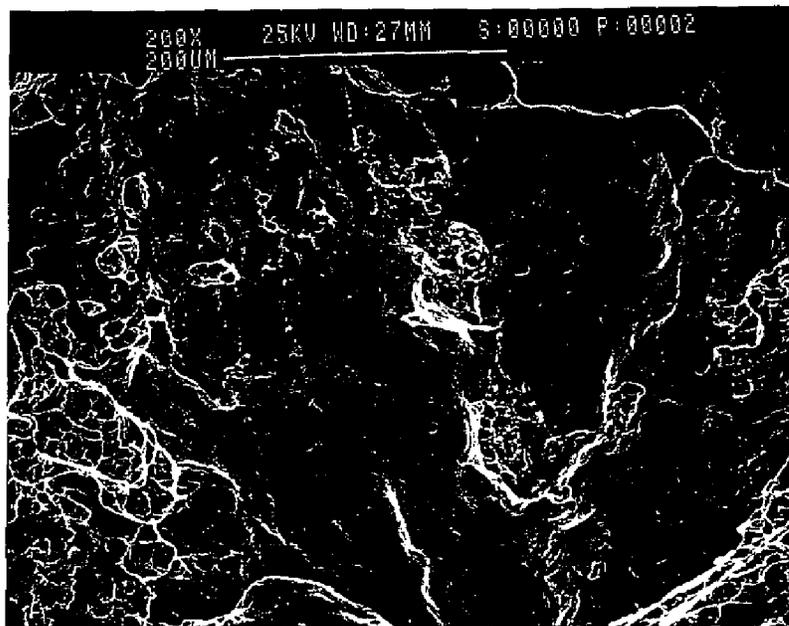


Figure 26. Fractograph from location #4 exhibits similar features as in Figure 24; X200.

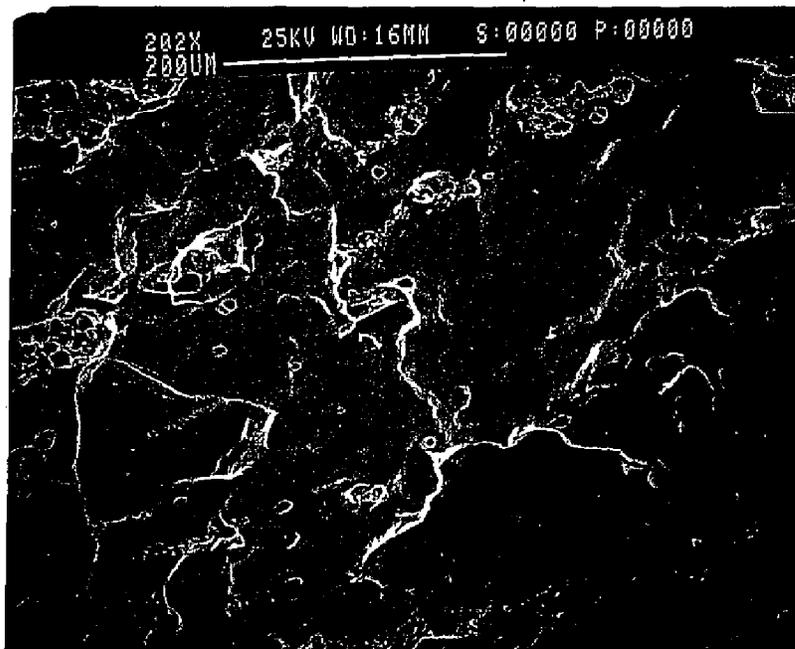


Figure 27. Fractograph from location #5 shows similar features as in Figure 24. The fracture initiated along the metal fold formed on the inside surface during manufacturing process; X202.