Title
MINUTES OF THE HYDROGEN SAFETY COMMITTEE ACCIDENT WITH SWAGELOCK CAP

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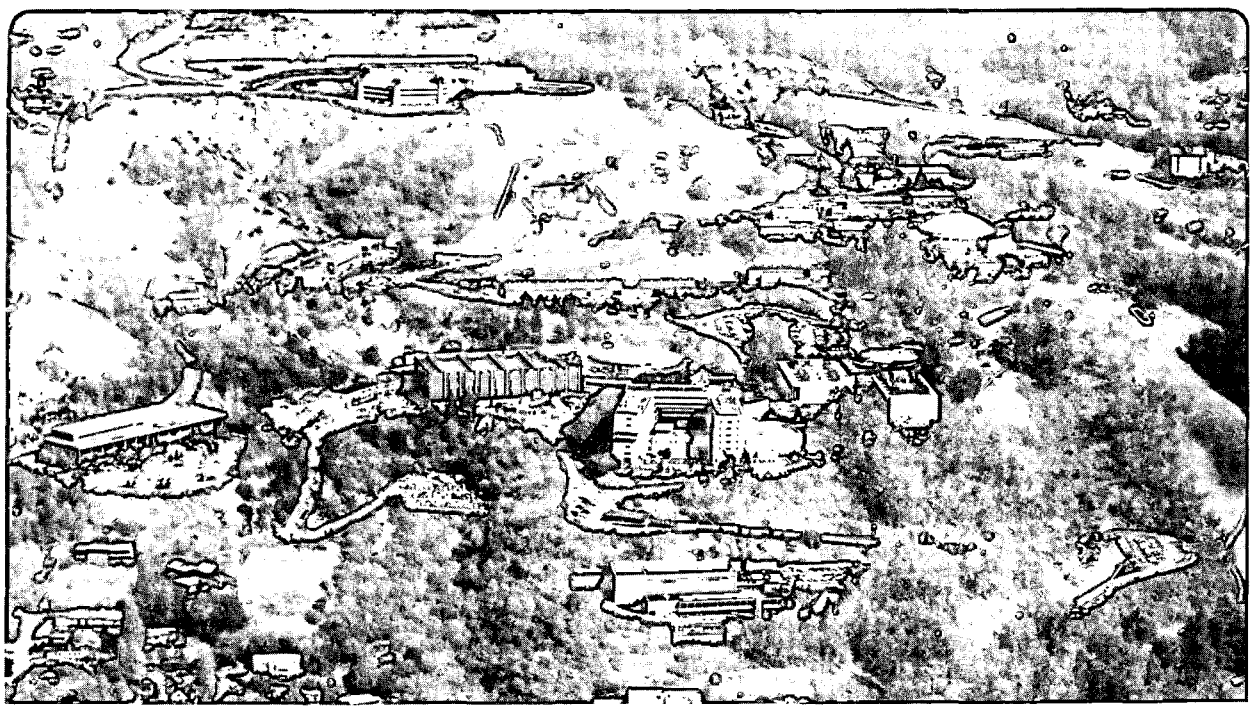

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ENGINEERING NOTE

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MINUTES OF THE HYDROGEN SAFETY COMMITTEE CP-105

ACCIDENT WITH SWAGELOCK CAP

A personal injury occurred on January 30, 1964, to a Bubble Chamber Compressor Room Operator while performing a hydrostatic pressure test. The accident occurred when the operator loosened a 3/8-inch Swagelock plug to relieve the pressure on a vessel containing 4000 psi hydrostatic pressure. The plug blew out of the union nut and penetrated his right hand parallel to the palm for a distance of about 2 inches. No bones were broken. One-and-a-half hours of surgery were required to remove the plug and repair the hand.

The pressure vessel was fabricated from a $3\frac{1}{2}$-inch Schedule 80 stainless steel pipe, 35-inches long. Stainless steel end plates with copper gaskets were fastened to the vessel with eight (8) tie bolts of $\frac{1}{2}$-inch diameter. Two 3/8-inch Swagelock butt weld elbows were welded to the side of the vessel. The design pressure is 1800 psi for hydrogen gas near liquid nitrogen temperature.

The hydrostatic test was a proof test and this was the third vessel tested in a series of four. The test consisted of pressurizing the vessel, isolating the vessel from the pump, and monitoring the pressure on a bourdon gage for a minimum of eight hours. This particular vessel had been under 4000 psi pressure for eight hours; the test has been completed and witnessed by Frank Barrera.

The system is shown on Figure 1.

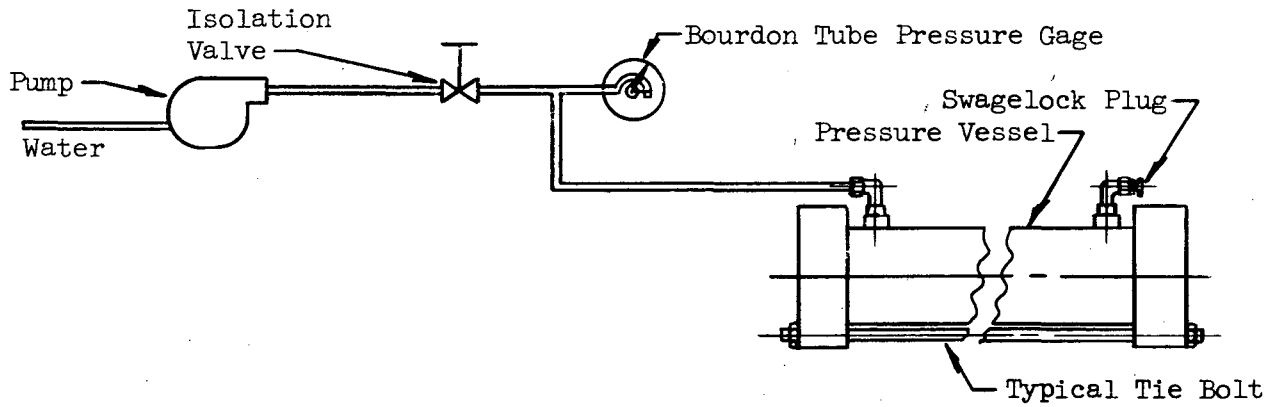

FIGURE 1

The location is shown on Figure 2.

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CP-106

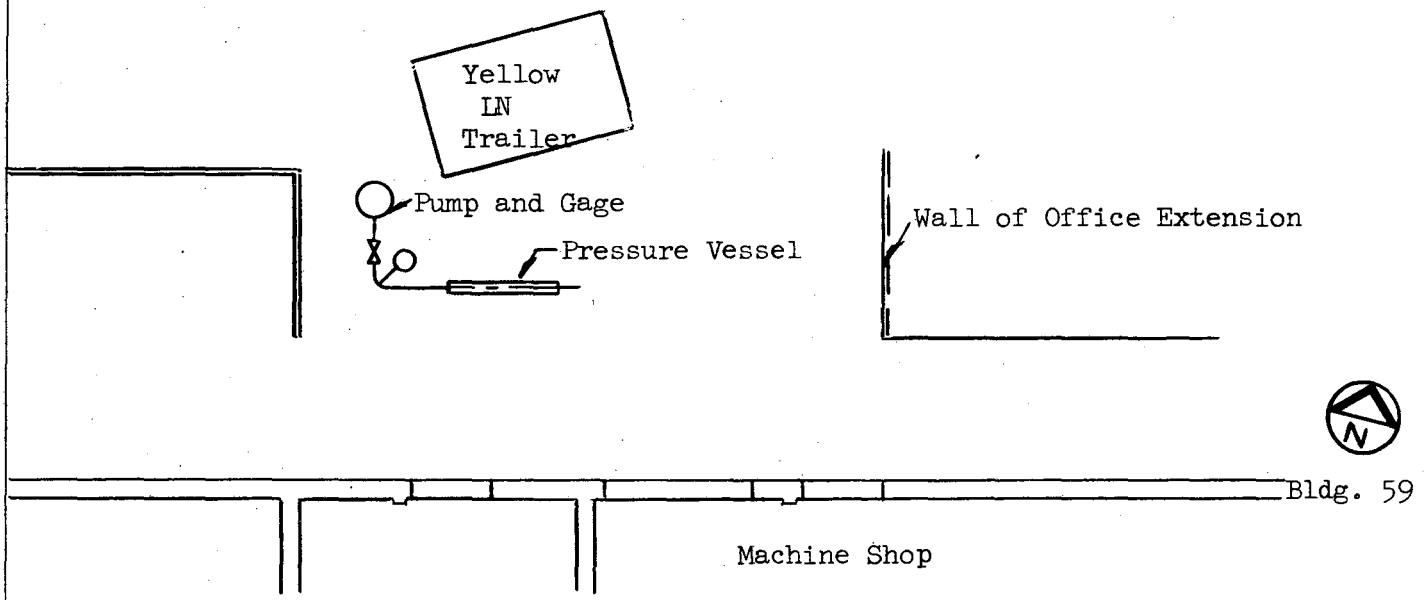

FIGURE 2

Precautions and Recommendations

1. Approach all high pressure systems with extreme care. Often the tendency is to respect gas systems and to treat hydrostatic tests as completely safe. Two facts make hard pressure hydrostatic tests hazardous:

   a. Trapped Air. Ideally all air should be bled out of a system. However a bourdon gage is impossible to bleed unless vacuum pumped. It is recommended that whenever possible the air be removed from a system with a vacuum pump before filling with water.

   b. Metal Spring Constant. The stress in the metal parts store energy. It is estimated that the stored available energy in the tie rods was 175 ft-lbs which is equivalent to the energy stored in a $\frac{1}{2}$ cubic inch of air at 4000 psi.

2. Install permanent bleed valves on all pressure testing equipment. Never bleed a line or relieve pressure by loosening a fitting. All piping and fittings on test equipment must be of the same pressure rating as the maximum pump pressure.

3. Test equipment away from traffic areas. Use barricades and barriers.

4. Avoid use of Swagelock plug fittings. If necessary for test work, barricade caps and tighten sufficiently to deform tube wall.

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