[redacted]

[redacted] b) Stainless Steel Pipes with Sulfuric Acid

[redacted]

Heyden Chemical Corporation, Princeton Industrial Plant

[redacted]

The process used by the Heyden Chemical Corp. for the manufacture of penicillin requires that 10% sulfuric acid be kept available for use in various reaction vessels. The sulfuric acid for this purpose is stored at room temperature in two [illegible] Pfaudler tanks, each containing 650 gallons of the solution. The acid is forced by pressure (5 to 10 p.s.i.) from these tanks to its destination through stainless steel pipes and fittings.

[redacted]

Phosphoric acid was first used in the processing of penicillin. The piping then used was 3/4 in. stainless steel 304 which gave satisfactory service. Later the process was altered so that sulfuric was used instead of phosphoric acid. Not anticipating any trouble, the 304 stainless piping was retained. The operators learned in a short while that their anticipations were overly optimistic -- the 304 corroded and commenced leaking sulfuric acid. The leakage was not sufficient to disrupt the process. Therefore, since the initial cost of piping installation was considerable, it was decided to retain the 304 as long as possible. However, another more serious difficulty arose. The sulfuric acid dripped on the cement supporting the two heavy tanks causing the cement to deteriorate to such a degree that fear was held for its physical strength. Before long, breakdown of the flooring progressed to the extent that it jeopardized the safety of the men and equipment on the floor below the tanks. Neutralizing methods were used to no avail. Faced with this potential threat to their equipment as well as process, the engineers at Heyden decided to take immediate action.

First they attacked the source of their problem, the stainless 304. This was solved by discarding the 304 and completely refitting with 316 which to date -- 9 months later -- has been serving its purpose. Then in order to protect themselves from any possibility of recurrence and further damage to their flooring, they decided to install a large lead pan completely covering the area under both fermentation vessels. In this manner acid dripping from any source would be caught and retained by the lead pan thereby protecting the [illegible] from

further attack. The pan is graded to a lead drain so that any acid drippings can be readily washed away. As an added precaution, the whole pan is frequently washed down with water.

To the obvious question: Why won't the acid handled in lead-lined tanks and lead piping? the answer is that the presence of lead in perchloric even in minute amounts is definitely undesirable. All heavy metals are contaminants in perchloric and considerable effort is expended toward keeping them out. This accounts for the dependence upon glass and stainless steel throughout the process.

CONSTRUCTION DETAILS

The lead pan consists of four sections of 12-lb. chemical lead burned together to form a continuous sheet 7½ ft. wide and 17 ft. long. All the seams are lapped 8 in. A bituminous layer protects the pan from direct contact with the concrete flooring. To make the 4-in. high retaining walls, separate sections of 12-lb. lead were burned on, then turned up and lapped over the upper edge of a 4-in. angle frame in front and on one side. In back and on the other side, the edges are turned up against the walls. As an added protection against vibration, the heavy tanks are supported on eight circular discs of 24-lb. lead, 14 in. in diameter. The pan is graded to a drain where any acid leaking from the fittings can be washed away. For added rigidity the floor drain is constructed of 4-in. pipe made of 3 per cent antimonial lead. Pipe lines passing through the pan and concrete floor are guarded against splashing and overflowing liquids by a 16-lb. soft lead boot or sleeve, 6 in. high and 6 in. I.D.

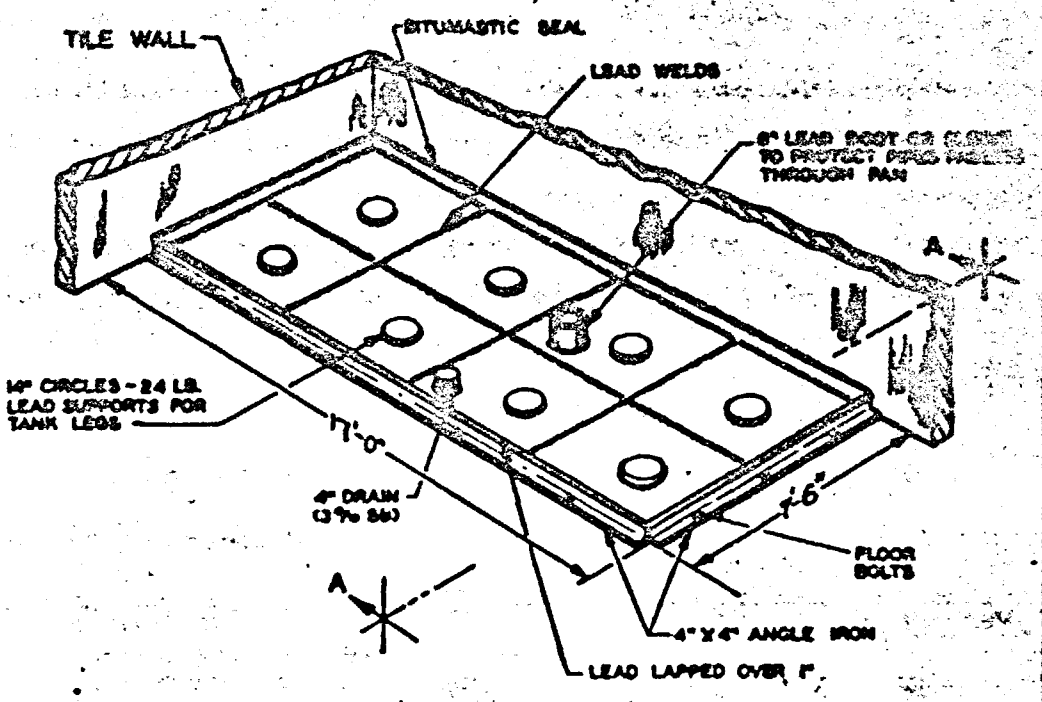
(See drawing).

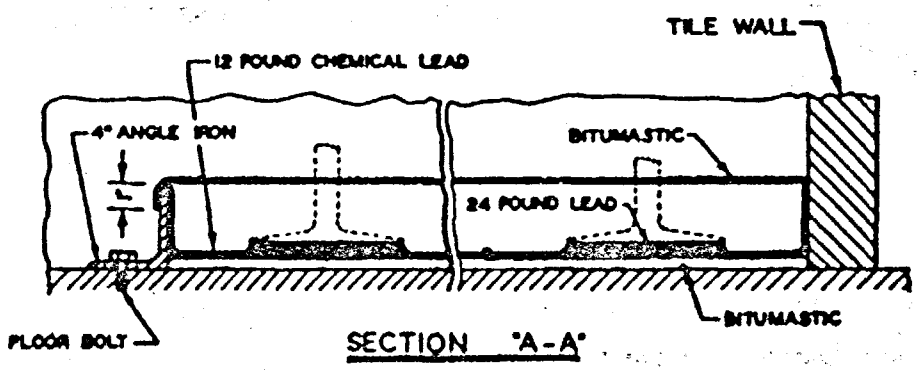
CONCLUSIONS

The Heyden Chemical Corp. adopted a simple method of protecting their concrete flooring from sulfuric acid attack by taking advantage of the time-tested resistance to this acid offered by lead.

Their experience with stainless steel 304, an alloy containing about 20% Cr, 10% Ni and 2% Mn, illustrates that care must be exercised when specifying stainless steel for anti-corrosion purposes. The mere name, stainless steel, does not imply complete immunity to corrosion.

The following stainless steels are not recommended for use with sulfuric acid (10% to 75%): 302, 303, 304, 308, 410, 416, and 430.





SECTION "A-A"

BY: R. H. ROLL OCTOBER, 1948	LEAD INDUSTRIES ASSOCIATION 420 LEXINGTON AVE. NEW YORK CITY, 17 N.Y.	LEAD SAFE PAN UNDER CHEMICAL EQUIPMENT CHEMICAL BULLETIN NO. 23