

Since 1931 the ASME Code for pressure vessels has included special construction requirements for pressure vessels containing lethal gases or liquids. A companion code, the API-ASME Pressure Vessel Code, published from 1934 to 1951 and widely used by the petroleum industry through about 1956, did not include any special requirements for vessels containing lethal substances. A comparison of the two codes clearly shows that the API-ASME Code provided a higher quality welded vessel by requiring higher weld quality control, material limitations, radiography, and heat treatment.

The API-ASME Code was withdrawn at the end of 1956 and from that point on most pressure vessels (unfired) for the petroleum industry in the United States and Canada were constructed to the requirements of the ASME Section VIII Pressure Vessel Code. Initially the ASME Code recognized that this additional requirement was not needed in the petroleum industry and included a footnote to that effect.

However, in 1972 the Code was revised to exclude any definition or guidance on lethal versus nonlethal substances for pressure vessel construction and made such determination the responsibility of the user and/or the user's designated agent.

The footnote that existed in the Code in 1972 follows. The underlined part was deleted that year.

“By ‘lethal substances’ are meant poisonous gases or liquids of such a nature that a very small amount of the gas or of the vapor of the liquid mixed or unmixed with air is dangerous to life when inhaled. For purposes of this Division, this class includes substances of this nature which are stored under pressure or may generate a pressure if stored in a closed vessel. Some such substances are hydrocyanic acid, carbonyl chloride, cyanogen, mustard gas, and xylyl bromide. For design purposes under this Division, chlorine, ammonia, natural or manufactured gas, any liquefied petroleum gas such as propane, butane, butadiene, and vapors of any other petroleum products are not classified as lethal substances.”

Because of the history outlined above, many industries normally do not designate a vessel as being in lethal service, but specify special requirements for some services. Those special requirements are:

- 100% radiography,
- post weld heat treatment,
- impact testing, and
- hardness limits on base material and weldments.

When the substance in the vessel is designated as lethal, all butt welds used to manufacture the vessel shall be fully examined using radiographic techniques. This means that lethal service vessels made using electric resistance welded or pressure forge welded pipe or tube also require radiographic examination for the weld seam length, even if the manufacturing specification for the pipe or tube required ultrasonic testing. [This is indicated in the revised interpretation VIII-1-83-77.] There are two exceptions to this requirement. UW-2(a)2 excludes the radiographic requirement for the welded seam in tubes or pipes fully enclosed within a vessel in which all butt welds are radiographically examined for the lethal service requirement. UW-2(a)3 excludes lethal service radiographic