Boilers and Unfired Pressure Vessels

Boilers (fired vessels) and unfired pressure vessels have many potential hazards in common, as well as having those unique to a specific operation These vessels hold gases, vapors, liquids, and solids at various temperatures and at various pressures, ranging from almost a full vacuum to pressures of thousands of pounds per square inch In some applications, extreme pressure and temperature changes may occur in a system in rapid succession, imposing special strains

Design, construction, testing, and installation of boilers and unfired pressure vessels should be in compliance with the applicable sections of the American Society of Mechanical Engineers' *Boiler and Pressure Vessel Code* (hereafter referred to as the "ASME Code"), and any federal, state, or local governing codes

The minimum requirements for the installation of high pressure boilers are covered in the *Code for Safety to Life from Fire in Buildings and Structures,* National Fire Protection Association Standard No 101

A *Synopsis of Boiler and Pressure Vessel Laws, Rules and Regulations, by States, Cities, Counties and Provinces, in the United States and Canada* is available from the Uniform Boiler and Pressure Vessel Laws Society This tells which governing bodies have made the ASME Code a legal requirement in their jurisdictions and what other compliances are required However, the owner of the boiler or pressure vessel must check with his local authorities to obtain the latest requirements

Compliance with the ASME Code is determined by authorized inspectors commissioned by the National Board of Boiler and Pressure Vessel Inspectors (See Fig 18-1)

The existing ASME Code contains seven sections

Section	Title
I	Power Boilers
II	Material Specifications
III	Nuclear Vessels
IV	Heating Boilers
VII	Suggested Rules for Care of Power Boilers
VIII	Unfired Pressure Vessels
IX	Welding Qualifications

Any or all of these sections may be obtained by application to the American Society of Mechanical Engineers

When pressure vessels are to be put in, it is usually advisable to secure the services of a competent boiler or unfired pressure vessel engineering consultant He will survey the plant or operation to determine the requirements, design a system that will satisfy them, and supervise installation and testing

If he arranges for the purchase of secondhand boilers or pressure vessels, he should have them inspected by authorized code inspectors who will report on repairs necessary before purchase Arrangements for inspectors can usually be made through the user's insurance agent Also, the government inspection department that has jurisdiction is listed in the *Synopsis* previously mentioned

In general, installation and maintenance should be in accordance with manufacturers' instructions Operating personnel should be trained, not only to operate equipment properly, but also to make routine safety checks and to know when to call in qualified maintenance personnel

Some common causes of failure in pressure vessels which should be anticipated and avoided insofar as possible are

1 Errors in design, construction, and installation
2 Improper operation, human failure, and improper education of operators
3 Corrosion or erosion of the metal
4 Mechanical breakdown, failure or blocking of safety devices, and failure or blocking of automatic control devices
5 Water hammer, or carryover of processed material
6 Failure to inspect thoroughly, properly, and frequently
7 Improper application of equipment
8 Lack of planned preventive maintenance

In addition to hazards presented by the possibility of their explosion, heating service boilers also present fire hazards They are a significant factor in hotel, store, apartment house, and religious institution fires Particularly, oil-fired equipment is at fault, al-

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This chapter was revised by Thomas F Powers, P E , and reviewed by selected members of the National Safety Council