

# Contact Safety

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# Mine Safety & Training Section

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## Causes of Boiler Failures

Today's modern "code built" boilers are designed and constructed to an extremely high standard with regards to safety. As long as construction corners are not cut and installation and construction inspections are performed as required by a qualified National Board (N.B.) Commissioned Inspector and said boiler is constructed and installed by a qualified boiler construction/installation company said boiler should be able to provide ample years of trouble free service. Most boilers are designed with a life expectancy of over 20 years.

If the boiler is a "code built" vessel, very few causes of boiler failure will be due to design and construction errors. Notice I said "code built". This means that the boiler was designed and constructed to American Society of Mechanical Engineers (ASME) standards, which is an industry benchmark and will be stamped as such on the boiler data nameplate. It is possible however to purchase boilers from overseas manufacturers for example that are not "code built" vessels, but as per NAC 512.575 those boilers are not allowed to be operated or installed in the State of Nevada. Once a "code built" boiler has been properly installed and has passed all

Of the initial safety tests and checks by a N.B. qualified inspector, it is up to the owner/operator to maintain the boiler and all safety devices and controls in a safe operational condition. Most reputable boiler manufacturers design their boilers with a 150% margin of mechanical safety. This means that every pressure retaining or structural component in that boiler is at least 50% stronger or thicker than what is needed to withhold and withstand the designed **Maximum Allowable Working Pressure (MAWP)** or support the structure. This is a built in safety margin before we even get to the additional "bolt on" safety devices.

Unless there is a substantial external force acting upon a boiler, as in an earthquake or a flood, the root cause of most boiler failures it is usually always "human error". For example if a brand new boiler fails catastrophically from a tube rupture or drum failure (both highly uncommon), was the root of that cause human error? Was the boiler not designed to the proper metal thicknesses? Human error. Did the manufacturer produce faulty or substandard steel material that was not caught during inspection? **Human error**. Did the boiler safety and control devices fail due to lack of testing being exercised? **Human error**. Did the metal fail due to excessive corrosion due to improper boiler water chemistry or treatment? **Human error**. Was the cold boiler repeatedly heated up too quickly causing undue stresses on the steel and the boiler finally failed and fractured at these stress areas? **Human error**.

Was the safety relief valve weeping so bad that the maintenance department screwed a pipe plug in the relief valve outlet piping until a new valve could be ordered and forgot, and two months later the boiler exploded? **Human error.**

Did an untrained, unsupervised boiler operator fall asleep or become distracted with the boiler controls in manual causing the boiler to continue to fire and over pressurize and fail? **Human error.**

Even faulty materials can be traced back to human error of the manufacturing process, to their quality control program or lack thereof. All too often I hear that the boiler failure was due to a faulty fitting or component. But was not this fitting or component constructed and manufactured by humans? Was not it supposed to be tested, exercised or observed by humans? Does not the failure of humans to carry out these tasks constitute human error rather than mechanical failure? If a mechanical component is left in service past its useful design service life and it fails, does not this really constitute human error? Of course if we do not want to be held accountable or responsible we will always look for someone or something else to blame the failure on when in fact we should all sit down and ask ourselves, what part did I play in this calamity and could it have been prevented if I was paying better attention to detail?

**“Most accidents don’t just happen. Most accidents are caused and are preventable.”**

# QUIZ

**If there is any specific topics you would like to learn more about please write on line below.**

## Questions (T/F)

- 1) In today's boiler market place most "code built" boilers are designed to a very low standard with regards to safety. T/F
- 2) Today's modern boilers are only designed for a useful life span of 5-6 years. T/F
- 3) Almost all accidents are inevitable and cannot be avoided. T/F
- 4) If need be it is acceptable to put a pipe plug in the outlet orifice of a safety relief valve and keep operating the boiler as normal? T/F
- 5) The root cause of most boiler accidents and failures is human error. T/F

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**Employee:**\_\_\_\_\_ **Date:**\_\_\_\_\_

**Mine/Company:**\_\_\_\_\_

**Address:**\_\_\_\_\_

**City:**\_\_\_\_\_ **State:**\_\_\_\_\_ **Zip:**\_\_\_\_\_