



www.thermodynamicsboiler.com

# A STEEL BOILER IS THE BEST CHOICE

## RESIDENTIAL OIL & GAS FIRED BOILERS

- SHOCK RESISTANT:** Steel boilers can withstand extreme temperature fluctuations (thermal shock) between the boiler supply and return line which promotes an increased life span.
- NO PUSH NIPPLES TO LEAK:** Steel boilers are welded. There are no push nipples of dissimilar metals causing expansion and contraction over the years thus creating a void between the sections.
- NO SEALS TO PINCH OR DRY ROT:** There are no O-rings to join sections which may shrink or deteriorate causing premature failure. Chemical additives can also shorten the life span of these O-rings.
- GREATER RESISTANCE TO IMPACT:** Steel boilers are impervious to most impacts. There is no brittle casting to crack.
- TOUGHER IN BODY STRENGTH, BUT LIGHTER IN WEIGHT:** Steel's tensile strength is greater.
- EASIER TO CLEAN AND MAINTAIN:** Steel boilers have flue passageways that are easier to clean which promote efficiencies.
- BETTER HEAT TRANSFER TO DOMESTIC COILS:** The coil in a Thermo-Dynamics boiler is placed directly in the line of the internal water flow enabling high heat transfer.
- BUILT-IN AIR ELIMINATION:** Thermo-Dynamics boilers include a vertical water feed-dip tube to eliminate air from the system.
- ACCESSIBILITY:** Steel boiler construction allows better accessibility to fittings and connections. There is better visibility of critical threaded connections that may weep and cause corrosion.
- ACCOUNTABILITY:** Every steel boiler from Thermo-Dynamics is tested hydronically under pressure by a third party inspector. Every piece of steel used is lab tested by the manufacturer and is tracked throughout the assembly process.



Constructed and hydrostatically tested in accordance with ASME Boiler Code, Section IV.



Tested and capacity rated in accordance with the standards of The Institute of Boiler and Radiator Manufacturers.

Reg. U.S. Pat. Off.



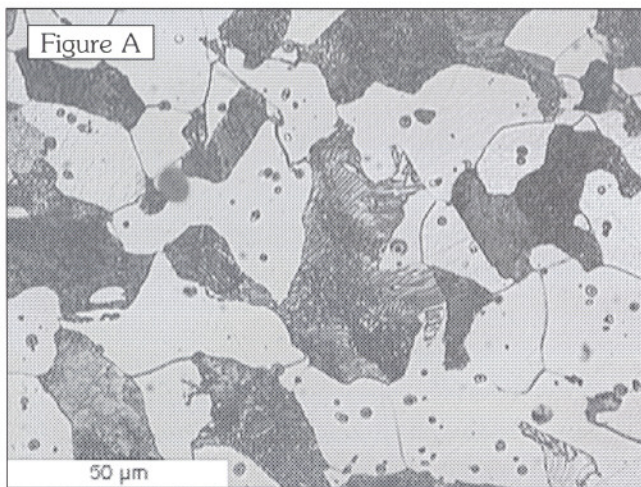
for Strength

# Thermo-Dynamics Boiler Company



# The Strength of Steel Lies in the Details

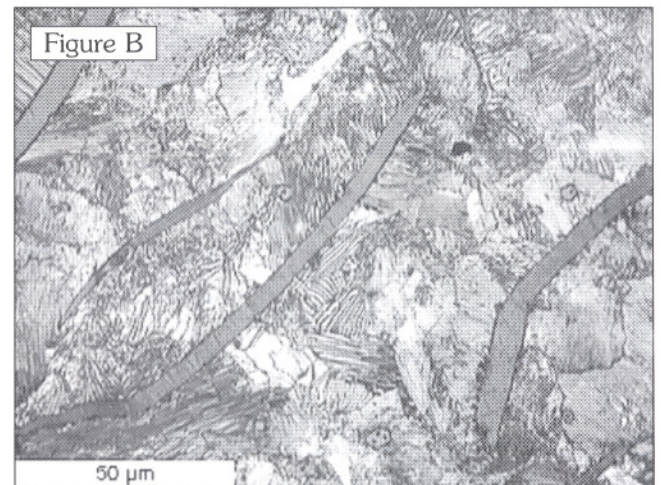
The reason why steel is such a superior material for the construction of heating boilers results from its highly organized microstructure. We use "mild steel" at Thermo-Dynamics Boiler Co. to fabricate our units. As seen in Figure A, mild steel is comprised of a matrix of pearlite (black areas) and ferrite (white areas). Pearlite is a two phase eutectoid of iron and iron carbide which gives the steel its property of



hardness. Alternatively, ferrite, which is composed of a ferrous alloy, gives steel its property of ductility. By balancing the composition of pearlite and ferrite, a collaborative effect is achieved. A Thermo-Dynamics Boiler is strong enough to handle the rigors of installation and the abuse of thermal shock, but is supple enough to handle the constant strain of expansion and contraction that results from heating and cooling cycles. Equally important to the chemical composition of steel is the profile of its grains. Steel is formed in a highly controlled process which results in a closely packed matrix with minimal impurities. The efficient packing of the individual grains eliminates the presence of voids (air pockets). The absence of voids from the steel matrix is important because it prevents the development of stress lines. Notice how the grains of pearlite and ferrite are relatively the same size and shape. They are also evenly distributed within the matrix resulting in an interlocking weave. For these reasons a Thermo-Dynamics Boiler is less susceptible to material fatigue and therefore, is inclined to have a long useful life.

Compare the photograph of Figure A to that of

Figure B and observe the differences between steel and cast iron. The microstructure of cast iron contains grains of many different materials. The grains are of different orientation. The long grey shards are graphite, the smaller light and dark grey filaments are of pearlite and the white background is ferrite. The presence of graphite results from the casting process as additional carbon is added to the molten iron to reduce the melting point of the metal and make it more fluid so that it flows easily into the cast molds. The size, shape and amount of graphite in the matrix are important in determining its strength and ductility. Too much graphite results in brittleness and is susceptible to micro-tears along its surface when placed under load. In order to mitigate this potential, other elements are added to the pour. Manganese is added to increase strength, magnesium to increase ductility and silicon to counteract sulfur impurities in the metal. The casting process requires the correct formulation, properly designed molds and suitable environmental conditions. The microstructure of cast iron is easily affected by its chemical composition and formation process (how it is poured). Since boilers



are pressure vessels, we feel that steel is a simple but time proven material of construction. The merits of cast iron and steel will always be richly debated, but we are convinced that steel is a superior material. The strength lies in the details and that is why we construct our boilers using only high quality steel. It is easy to conclude why Thermo-Dynamics Boilers are "The Boilers of Choice."

## Thermo-Dynamics Boiler Company

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