Stack Design
and
Package Boiler/Burner Operation

Firetube boiler/burner packages with the exhaust stack and breeching attached to them operate as a system. Each item affects how well the other items perform their task.

The burners provided on Johnston products have been designed for maximum efficiency on a firetube type boiler. Refinements in combustion technology and burner designs have made it more critical that everyone reviews the total system to ensure proper operation. This will avoid many problems that are too often considered combustion related but are really system generated, resulting from improper flue gas breeching and stack design.

Packaged firetube boilers are designed to operate at their peak performance with short, straight flue stacks. Other stack configurations can be used if they are properly engineered. Improper exhaust system designs can cause problems that come and go, or vary with the stack temperature, ambient temperature, high wind conditions, operating status of other boilers connected to the exhaust system, and many other varying conditions.

A few of the problems to check in the event of erratic operation and/or problems that appear to have no solution are:

1. **STACK HEIGHT** - "The stack or chimney should be of sufficient height to extend above the roof of the build or adjoining buildings to avoid down drafts in the stack or the possibility of carrying combustion gases to undesirable locations such as air inlet ducts or open windows in adjoining or nearby builds".①

   A very high stack can create a high back pressure (a high positive pressure at the boiler stack connection) that the burner must overcome which may turn into a high draft (a high negative pressure at the boiler stack connection). This can cause burner stability problems after the system has warmed to operating temperatures.

   A very high stack that does not have some type of insulation, in addition to the problem listed above, can have widely ranging draft conditions caused by changes in the ambient air temperature. Cool ambient temperatures can chill flue gas products and reduce or eliminate draft conditions that existed with warmer ambient air. These conditions can change winter to summer, day to night, and sometimes day to day.

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① PACKAGED FIRETUBE BOILER--ENGINEERING MANUAL--", American Boiler Manufacturers Association, First Edition, 1971, page 28