

Executive Summary Legacy Wall Furnace

1 - Gas Quality and LNG Study Objectives

This research study was designed to assess how residential and small commercial/industrial end-use equipment responded to changes in gas quality and to determine if Southern California Gas Company (SCG) needs to modify its current Gas Quality Standards (Rule 30). The major objectives of the study were as follows:

- Evaluate each selected unit to determine any issues relating to equipment safety and performance. Equipment safety includes changes in Carbon Monoxide (CO) levels, combustion stability and Lifting, Flashback, and Yellow Tipping.
- Compare measured and observed results against the major natural gas interchangeability indices, including Wobbe Number, Lifting, Flashback, Yellow Tipping and Incomplete Combustion.
- Collect NO_x emissions data during testing

2 - Selection Criteria

A Legacy Wall Furnace was selected for the study due to the large numbers of these units operating in southern California. Since the use of such appliances is seasonal, they typically have long service-lives. A previous SCG study indicated that such atmospheric burner-equipped units could satisfactorily combust gases with a wide range of heating values and compositions. This unit was selected to corroborate those previous findings. There was a concern over the potential for heat exchanger cracking when the appliances are over fired. Factors and concerns that led to the selection of the Legacy Wall Furnace for this study include:

- Performance/safety may be dependent on flame characteristics
- Safety concerns related to flue gases
- Historical combustion system related safety concerns
- High density in southern California
- Recommendations from credible industry experts



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5 - Test Results and Findings

There were no operational, ignition, flame stability or safety problems experienced with operation of this appliance. The Legacy Wall Furnace was tested over a wide range of operating conditions and gas compositions according to developed test protocols¹.

- The wall furnace showed significant CO emission level sensitivity to the 1150 HHV / 1437 Wobbe Number (Gas 3).
- With respect to the concern over heat exchanger cracking, there were no critical temperature changes experienced.
- Generally, CO emission concentrations tracked with the Wobbe Number and the highest average concentration was experienced with the highest Btu/highest Wobbe Gas Number 3.
- Conversely, with the exception of two test runs where unexpected combustion characteristics were experienced, NO_x emission concentrations were lower with the higher Btu/higher Wobbe Number gas blends (Gases 3, 6 and 4a).

4 - Legacy Wall Furnace Specifications

- **Description:** Gravity Vented Wall Furnace with a stamped steel heat exchanger vertically oriented with a draft diverter on top
- **Burner:-** 4 in-shot atmospheric burners firing vertically into heat exchanger
- **Maximum input rating:** 35,000 Btu/hr
- **Type of fuel:** Natural Gas
- **Required gas supply pressure:** 4.5 - 10.5" W.C.

¹ Testing protocols used in this program were derived from industry standards and regulatory test procedures. Note, however, that based on the needs of this program and the operating and design characteristics of equipment tested, adherence to the industry and regulatory testing standards was not literal. The reader is cautioned that no inference can nor should be drawn as regards certification of these devices to the industry or regulatory requirements as a result of this program.