

## Executive Summary

### Legacy Gravity Vented Wall Furnace

#### 1. Gas Quality and LNG Research Study Objectives

This research study was designed to assess how residential and small commercial/industrial end-use equipment respond to changes in gas quality and to determine if Southern California Gas Company (SCG) needs to modify its current Gas Quality Standards (Rule 30).

Two main tests were conducted to evaluate how the appliance will react to different test gases when (a) tuned to the rated input while using Base Gas (low heating value and low Wobbe Number) and (b) tuned to the rated input using Gas 3 (highest heating value and highest Wobbe Number). The major objectives of the study during these tests 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, flame lifting, flame stability, flashback and yellow tipping. Equipment performance includes ignition, combustion and output stability.
- Collect NO<sub>x</sub> emissions data during testing.

#### 2. Selection Criteria

This type of (legacy) gravity vented wall furnace was selected for a third test to verify the results obtained in two previous tests (October 1995 and November 2004) and to evaluate how it will react to different test gases after tuning it with the highest Wobbe Number and highest heating value gas; Gas 3.

Tuning the appliance included adjusting the input rate by changing the orifice and/or adjusting the manifold pressure and adjusting the primary air until the emissions matched the ones when tuned with Base Gas.

This wall heater is the same unit as the one tested in November 2004 but not the same as the one tested in October 1995. However, both units tested use similar controls, burners and heat exchangers. Initially this type of Wall Heater was selected to be tested because of the following factors:

- Large number of these units in the Southern California Gas Company territory.
- Long life expectancy due to the short and mild winters in Southern California.
- Potential of heat exchanger to crack due to over firing.

### 3. Test Results and Findings

The wall furnace was tested over a wide range of operating conditions and gas compositions according to developed test protocols<sup>1</sup>. Results obtained from all tests conducted revealed that:

- There were no operational, ignition, flame stability, flame lifting, flashback, yellow tipping or safety problems with the different gases or during transitioning.
- CO emissions at increased manifold pressure when tuned with either Base Gas or Gas 3 were above the ANSI Standard CO limit.
- None of the temperatures monitored had critical changes.
- The flame temperature and NO<sub>x</sub> emissions followed the opposite pattern as the Wobbe Number when the unit was tuned with Base Gas.

Results while appliance was tuned with Base Gas corroborate results from testing conducted in October 1995 and November 2004.

### 4. Equipment Specifications

- **Description:** Legacy Gravity Vented Wall Furnace
- **Burner:** 4 in-shot atmospheric burners firing vertically into heat exchanger
- **Input rate:** 35,000 Btu/hr
- **Type of fuel:** Natural Gas
- **Required gas supply pressure:** 4.5 - 10.5 in. w.c.

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<sup>1</sup> 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.