

Executive Summary

Gas Range

1. Gas Quality and LNG Research 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).

Two main tests were conducted to evaluate how the appliance will react to the 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 8 (medium heating value and medium Wobbe Number). The major objectives of the study during these two tests were as follows:

- Evaluate the selected unit to determine any issues relating to equipment safety and performance. Equipment safety includes changes in carbon monoxide (CO) levels, flame lifting, flashback and yellow tipping. Equipment performance includes ignition, combustion and output stability.
- Collect NO_x emissions data during testing.

2. Selection Criteria

This type of gas range was selected to be tested because of the following factors:

- To investigate concerns by industry experts, related to induced combustion systems with rich gases.
- There are a large number of these types of units in the Southern California Gas Company territory and they have a long life expectancy.
- Safety concerns related to flue gas if they are not vented properly.

3. Test Results and Findings

The gas range was tested over a wide range of operating conditions and gas compositions according to developed test protocols¹. Results obtained from all tests conducted revealed that:

Results obtained from all tests conducted with oven door closed revealed that:

- There were no operational, ignition, safety, flame stability, flame lifting, flashback or yellow tipping problems.
- The temperature of the surface above pilot peaked at 866°F with Gas 3 during the 12% Overfired Tests - Tuned w/ Base Gas.
- Tuning the unit with Gas 8 did not create any significant safety, emissions, performance or operational problems.
- Most of the emissions and temperatures monitored during the test were more stable when the unit was tuned with Gas 8.
- Highest CO emissions (787 ppm) were generated with Gas 3 during the decrease inlet pressure test.

All emissions reported during with the two tests with the Oven Door Open are uncorrected because the high percentage of O₂ in the sample.

Results obtained from oven door open tests revealed that:

- Top Burners Hood – average CO emissions were lowest with Gas 3 at 7 ppm and highest with Base Gas at 9 ppm. Average NO_x emissions were lowest with Base Gas at 13 ppm and highest with Gas 3 at 15 ppm. The NO₂ emissions were not more than 10% of total NO_x in any of the NO_x measurements.
- Oven Hood – CO emissions were highest with Base Gas, averaging 27 ppm (first run), 20 ppm (second run) and 21 ppm (third run). Gas 7 and Gas 3 generated lower emissions (17 ppm and 18 ppm). Average NO_x emissions were lowest with Base Gas (second run) at 1 ppm and highest with Gas 3 at 3 ppm.

Results obtained during the Hand Held Emissions test with the oven door open revealed that:

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.



- The emissions concentrations typically decreased as the probe was moved away from the appliance.
- The highest CO emissions were 35 ppm with Base Gas (Middle at 6 in.). The highest NO_x emissions were 4 ppm and it occurred with all the test gases – Base Gas (Left at 6 in.), Gas 7 (Middle at 6 and 12 in.), and Gas 3 (Right 12 in.).
- The NO₂ emissions were not more than 50% of total NO_x in any of the NO_x measurements.

4. Equipment Specifications

Description	Gas Range
Burner	Atmospheric burner
Maximum rated input	54,400 Btu/hr
Type of fuel	Natural Gas
Required gas supply pressure	4.5 - 10.5 in. w.c.