Residential Investigation #2

ENGINEERING REPORT

June 2006

PREPARED FOR: **INSURANCE COMPANY #1**

ATTENTION: **MR. CODY LEERY**

INSURED: **EA WINTHROP**

DATE OF LOSS: **DECEMBER 2005**

LOSS LOCATION: LOUISVILLE, KENTUCKY

POLICY NUMBER: N/A

CLAIM NUMBER: <omitted>

IC1 FILE NUMBER: **<omitted>**

Introduction

On December 2005, smoke sooting was discovered in the single family tri-level residence owned and occupied by the insured, Ms. Ea Winthrop, which was located in Louisville, Kentucky. Per the report of Mr. Cody Leery, Adjuster for Insurance Company #1, the sooting was discovered during the investigation of a non-related loss claim.

On December 2005, Mr. Leery contacted Investigation Company #1 and requested Investigation Company #1's assistance in determining the origin and cause of the sooting. It was believed that the sooting might have been caused by malfunction of the residential heating system. The author of this report, Scott A. Jones, P.E. and Senior Mechanical/Electrical Engineer of Investigation Company #1, (812) 944-9988, was assigned to discover the origin and cause of the sooting.

The observations and conclusions from the investigation are included in this Engineering Report.

Background

Interview with Ms. Ea Winthrop, Homeowner

On December 2005, the author interviewed Ms. Winthrop to learn her observations with regard to the events preceding discovery of the sooting. Prior to her notification of the sooting during the prior, non-related claims investigation, Ms. Winthrop did not have an awareness of the sooting build-up. The following salient items were discussed:

- Ms. Winthrop reported that she had lived in the residence for 5 years.
- She reported that a natural gas log set in the Family Room masonry fireplace was included with the house.
- She reported that she had used the gas logs to heat the residence for 4 of the prior 5 years and that she had not used the gas logs during the current (late 2005) heating season.
- She reported that her fiancée (deceased) had performed unknown maintenance on the gas logs during the summer of 2005. She stated that her fiancée typically operated the log set, which was equipped with a standing gas pilot flame.
- Ms. Winthrop reportedly did not use a kerosene heater to heat the residence.

- She reportedly used candles as decoration only.

- She reportedly had IAM Heating & Air Conditioning perform a routine check up of the heating system during the summer of 2004. She reported no anomalies were discovered during the maintenance.

Observations

On December 2005, the author inspected the loss residence with Ms. Winthrop in attendance for the entire inspection. The front (north) side of the tri-level residence appeared as shown in *Photograph 1*. The masonry chimney appeared on the east side of the residence as shown in *Photograph 2*.

Soot deposits were evident on nearly all horizontal and vertical surfaces within the residence. Soot deposition was especially prominent on the ceiling in the Family Room (*Photograph 3*). There was evidence of preferential deposits on the Kitchen ceiling due to the travel of soot from thermophoresis (i.e., motion between warm and cool areas – *Photograph 4*).

Soot-stained carpet around a heating supply diffuser in the Living Room (*Photograph 5*) revealed soot transport via the heating supply and return air system.

Heating and air conditioning to the residence was supplied by an <omitted> heat pump air handler that was situated in a Family Room utility closet (*Photograph 6*). The author removed the 14 inch x 24 inch fiberglass return air filter for inspection. As shown in *Photograph 7*, the upstream (i.e., entry) side of the fiberglass element was slightly soot stained.

The heat pump air handler was equipped with an electric resistance backup heater bank. No mechanical or electrical anomalies were discovered from inspection of the heat pump system.

Prominent soot staining was evident on the creek rock façade of the masonry fireplace in the Family Room (*Photograph 8*). Extensive soot deposits were evident on the inner sides of glass panels on the decorative front fireplace enclosure. Examination of the masonry fireplace revealed extensive loose soot buildup on the inner walls and damper plate (*Photographs 9 and 10*).

The decorative ceramic logs that had been stacked over the gas log set burner system were extensively soot covered from extended service with improper combustion (*Photographs 11 and 12*).

At the time of the inspection, the pilot light was extinguished, and the gas log control valve had been positioned in the "OFF" position. The author discovered finely divided lava rock had been placed around the U shaped gas log burner tube. All natural gas outlet ports had been completely submerged in the lava rock. The author excavated the burner tube to reveal one of the gas ports (*Photograph 13*).

The author discovered one burned candle sitting upon the fireplace hearth (*Photograph 14*).

Discussion/Conclusions

The subject residence was heated through the use of a heat pump/air handler system with electrical resistive back up heating. Neither the heat pump nor the resistive back up system utilized combustion processes to produce heat; therefore, the systems were incapable of producing soot.

Inspection of the masonry fireplace in the Family Room revealed that a natural gas log system was in place. Inspection of the natural gas log assembly revealed that the system was designed to operate as a vented system. As with all vented systems, the chimney damper must be open during operation of the log unit to exhaust the relatively incomplete products of combustion, including soot particulate.

Per the report of the insured, the log system had been utilized as supplemental heat for the last 4 of 5 years. At the time of the inspection, the natural gas burner tubes had been completely covered with finely divided lava rock. It was not known whether the insured's fiancée covered the burner tubes during the last known maintenance on the unit that reportedly occurred during the summer of 2005.

With the burner tubes completely submerged in the finely divided lava rock, it is believed that the burner flames would not have been properly oxygenated, which would have exacerbated the already poor combustion characteristics of the vented gas log set. Ms. Winthrop noted that the log set had not been operated since the time of the last maintenance by her fiancée.

The subject residence showed evidence of long term soot generation and distribution throughout the residence. There was evidence of soot transport by both thermophoresis and convective transfer through the heat pump air supply and return air systems. The interior of the fireplace, including the damper plate, was uniformly covered with loose carbon particulate. *It is believed by the author with a reasonable degree of engineering certainty that the subject natural gas log set had been improperly operated during her*

period of ownership with the fireplace damper plate shut, which permitted the products of combustion to enter the Family Room.

Author's note: following the loss residence inspection, the author advised the insured that continued operation of the gas log set was unsafe. The author advised that a properly trained professional must evaluate the condition of the system and advise her of corrective actions that must be taken to restore proper operability of the log set. The author further advised that the subject log set must be operated with the damper open to vent combustion gases outdoors.

The analysis and conclusions are based upon information reviewed to date, plus general engineering knowledge and experience. Information reviewed at a later date may warrant modifying or augmenting the conclusions.

We appreciate the opportunity to work with you on this evaluation. Pending further direction, this file is considered closed. Please let us know whether we can be of further assistance to you.

Sincerely,

Investigation Company #1

Scott A. Jones, P.E., C.F.E.I.
Senior Mechanical Engineer/Electrical Engineer

	Photo	***Caption***
	1	View of the front (west) side of the loss residence
	2	View of the east side masonry chimney for the family room fireplace
	3	View of soot staining on Family Room ceiling
	4	View of soot staining on Kitchen ceiling and preferential soot deposits due to thermophoresis
	5	Soot-stained carpet around heating supply diffuser in Living Room
	6	Residential heat pump air handling unit in Family Room closet

	7	Soot staining of upstream side (entry side) of fiberglass return air filter element
	8	Soot staining of creek rock façade on the front of the masonry fireplace
	9	Soot staining on the masonry surrounding the gas log set
	10	Soot staining on the fireplace masonry surfaces and damper
	11	Soot stained ceramic logs in situ at start of inspection
	12	View of extensive soot deposition on ceramic logs

	13	Gas burner outlet port submerged in finely divided lava rock
	14	Candle discovered on fireplace hearth