

# Residential Investigation #1

June 2006

Ms. Darcy Henderson  
Insurance Company #1

Re:            *Insured:*                    Beverly McCormick  
                  *Inspection Location:*    Bloomfield, Indiana 47424  
  
                  *Claim No.:*                    <omitted>  
                  *Date of Loss:*                February 2006  
                  *IC2 Project No.:*            <omitted>

Dear Ms. Henderson,

On February 2006, a fire occurred in a single-wide manufactured home that was owned by the insured. The modular home was manufactured by Home Maker #1 of Indiana. The age of the residence was unknown.

Ms. Darcy Henderson, Product Investigator for Insurance Company #1 contacted Investigation Company #1 and requested assistance in determining the origin and cause of the fire. Mr. David Riviera, CFI and Fire Investigator for Investigation Company #1, was assigned to conduct the fire origin and cause investigation.

On March 2006, Mr. Riviera contacted the author of this report, Scott A. Jones, PE, CFEI and Senior Mechanical/Electrical Engineer of Investigation Company #2, (812) 944-9988, and requested the author's assistance in determining the cause of the fire. Mr. Riviera opined that the fire originated at or within a Richmond Nitro natural gas-fired furnace. Mr. Riviera reported that the insured was in the bathroom at the time of the fire and was alerted to the same by fire alarm(s) within the residence.

Per Mr. Riviera, the heat exchanger within the furnace was replaced in January 2006 to correct a Consumer Product Safety Commission (CPSC) concern.

The author's observations and conclusions are contained in this Engineering Report.

## *Observations*

On March 2006, the author inspected the loss residence. Mr. Riviera and Mr. Bob Rehnquist, and Mr. Robin Palamino, who were representing the interests of the furnace manufacturer, were in attendance for the inspection.

There was no observed heat or fire impingement damage to the portions of the subject furnace housing, visible portions of the heat exchanger, blower, burner system, or electrical controls. The furnace was identified as a Richmond Nitro, Model <omitted> natural gas-fired furnace. The author verified that the regulator had been properly converted for natural gas operation.

Inspection *below* the furnace, however, revealed substantial charring of the floor joists and plastic materials situated under the furnace as shown in *Figure 1*, which was recorded while looking from the crawlspace up at the sub floor beneath the furnace.



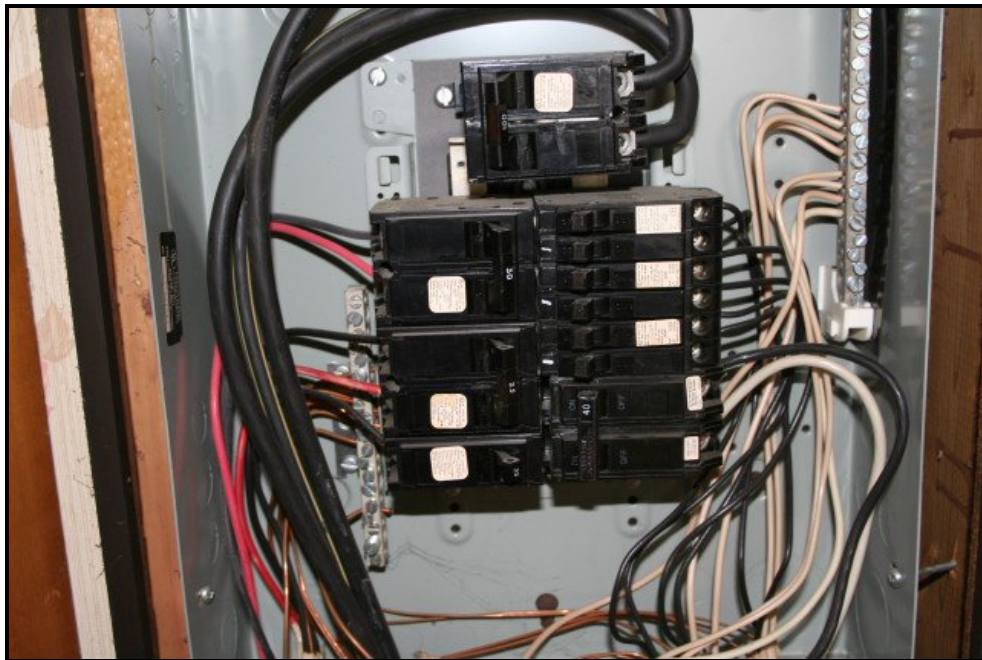
**Figure 1 - View Looking Up at Sub Floor below Furnace**

As shown in *Figure 1*, the floor joists around the furnace were charred. The electrical insulation on the conductors that spanned the region was completely consumed but there were no indications of conductor-to-conductor or conductor-to-ground shorting on any of the conductors. Nearly all plastic materials in the region below the furnace, including the fiberglass insulation binder and covering that surrounded the ducts was extensively charred or consumed.

The author performed a detailed inspection of the electrical service and grounding to the subject residence to the requirements taught in the *National Electrical Code*, NFPA 70,

for manufactured homes. Specifically, manufactured homes are required to have a 4 wire service system with an isolated ground and neutral.

Inspection within the residence revealed that the residence was improperly connected to the electrical service. The conductors of the three wire service (i.e., L1, L2, and neutral) were properly connected to their respective connections on the main disconnect breaker and the isolated neutral bus bar. But, the service installer did not connect the isolated ground bus to a grounding electrode via a grounding electrode conductor. Consequently, the residence had a floating ground system that was not connected to earth.



**Figure 2 – View of Residential Service Connection with No Grounding Electrode Conductor**

### *Discussion/Conclusions*

There was no observed damage to the furnace structure, heat exchanger, blower, burner system, or electrical controls/conductors. *It is therefore believed with a reasonable degree of engineering certainty that the subject Richmond Nitro furnace did not serve as the ignition source for the fire.*

Inspection of the structural materials beneath the furnace revealed that all wood materials surrounding the screws and nails that spanned between the sheet metal floor pan of the furnace and the wood joists (reference *Figure 1*) had been consumed. Inspection of all of the conductors that traversed the fire and heat affected region beneath the furnace revealed no indications of conductor-to-conductor or conductor-to-ground shorting of the same.

*It is believed with a reasonable degree of engineering certainty that the subject furnace, and more specifically the steel natural gas pipe that was attached to the furnace, served as a ground conductor to earth. It is believed that a ground fault occurred at some point on a premises distribution conductor or attached component.*

The errant ground current flowed through the structure and traveled through the furnace floor pan attachment screws. The current then utilized the steel natural gas supply pipe to flow to earth. The path was sufficiently high impedance to avoid protective action by the premises over current circuit breaker. *The current flow through the structure caused sufficient resistive heating to serve as ignition source for the fire beneath the furnace.*

*The fire was caused by improper connection of electrical service to the manufactured home by an unknown party(s). Contrary to the requirements of the National Electrical Code, the service installer did not install a grounding electrode or conductor to the manufactured home isolated ground bus.*

The conclusions drawn in this investigation are based on an analysis of the information collected during the site visit, researched data and engineering knowledge, and information provided by the client. Information or data that becomes available at a later date may justify the modification of the results or conclusions at that time. IC2 maintains additional information regarding the subject claim on file and the preparation of a more detailed report can be undertaken if warranted in the future.

We appreciate the opportunity to work with you on this claim. Pending further direction this file will now be placed in a closed status. Please let us know if we can be of further assistance on this claim or any future claims.

Sincerely,

Investigation Company #2

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