

# Current Issues with Solid-Fuel Inserts in Factory Built Fireplaces and Chimneys

Installer and Inspector Perspectives from the Field

Prepared for the STP127/S600E UL Joint Task Group  
on Solid-Fueled Space Heaters (2021)

*Written by:*

**Daniel Freeman**

970-644-1172 / dan@freemanfire.com  
The Chimney Doctor, Ltd. / Freeman Fire Inspectors, Ltd / InspectionFire LLC  
F.I.R.E. Certified Fireplace and Chimney Inspector #FCI-338  
International Association of Arson Investigators, Fire Investigation Technician  
National Fireplace Institute, Certified Master Hearth Professional (Wood, Pellet, Gas) #176537  
National Chimney Sweep Guild, Certified Master Chimney Technician #225  
Chimney Safety Institute of America, Certified Chimney Specialist # 41  
International Code Council, Certified Residential Mechanical Inspector #9688396

*Endorsed & Edited by:*

**Bill Ryan**

Ryan & Sons Chimneys / Ryans Consultant Group  
F.I.R.E Certified Fireplace and Chimney Inspector #FCI-089  
National Fireplace Institute, Certified Master Hearth Professional (Wood, Pellet, Gas) #138756  
International Association of Fireplace and Chimney Inspectors, Certified Professional Inspector #CPI-002  
International Code Council, NJ RCS Certified Building Inspector  
Chimney Safety Institute of America, Certified Chimney Sweep #4271

**Michael Segerstrom**

Bridgewater Chimney Sweeps LLC  
F.I.R.E Certified Fireplace and Chimney Inspector #FCI-113  
Chimney Safety Institute of America, Master Certified Chimney Sweep #25  
National Fireplace Institute, Master Hearth Professional (Wood, Pellet, Gas) #150067

*\*\*\*Disclaimer\*\*\* Engineering only approaches are insufficient by themselves to establish a standard and create real world testing criteria that mimic realistic conditions. In-field experience working with and inspecting these systems as actually installed is essential to an understanding of issues that may arise. Without including this experience a standard cannot be effectively developed that will address, or attempt to address, all noted or potential issues. Minor errors may exist in the text and where present do not discount any other information presented in this document. Some information may not be available to us as inspectors and installers that is available to UL employees, engineers, manufacturers, or others. We reserve the right to modify or update this document at any time based on any new information.*

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To all interested parties,

In evaluating the installation of solid-fuel inserts into masonry and factory built systems there are many considerations. The possibility of creating UL standards that seek to standardize and test installations of this type will require that all potential and possible issues that can be identified are evaluated and addressed as part of the proposed and introduced standards. The issues noted in this report explore some conflicts found in codes, standards, manufacturer's instructions, and as noted in the field during inspection, service, or installation work.

Currently the existing standards in the United States do not address the installation of inserts into masonry or factory built fireplaces (UL127,UL1482,UL737,UL907), or the installation of metallic liners into or through factory built fireplace and chimney systems (UL127,UL103/103HT, UL1777). Essentially insert manufacturers rely on a masonry system being constructed to code, or on a factory built system being properly installed, for them to 'allow' or 'approve' this type of installation in their manuals. The way manuals are written leads installers and consumers to believe that the appliance is listed and tested by an approved listing agency, for an inserted application, and installed per the listing. This is not the case.

The lack of a UL standard around which to test and manufacture these products has resulted in the requirements on how to install these inserted appliances being in large part developed by the insert manufacturers themselves. Different manufacturers have different requirements. In their individual testing some manufacturers may have addressed one or more issues listed in this report while potentially not being aware of other potential issues. The testing parameters and raw data behind these tests, whatever tests may have taken place, are often unknown or not shared between manufacturers, with installers, consumers, or the industry in general.

There are many issues not addressed in manufacturer installation instructions or tested in a listing laboratory and the installer is often left holding the liability for any issues that may arise, or field-engineering a solution to maintain their integrity in front of the consumer.

As there is no common standard or listing for this type of installation currently inserts cannot be installed into a masonry or factory built fireplace or chimney system and be installed, per code, in accordance with the **terms and conditions** of the applicable listings; UL1482, UL127, UL737, UL907, UL103/103HT, or UL1777.

## FOUNDATION

To help understand this issue more fully let's begin by laying out some of the code requirements for the installation of any factory built system, which would include factory built fireplaces, factory built chimneys, factory built stainless steel liners, as well as any installed factory built

inserts, or connected factory built appliances. In the following pages the codes shared are to demonstrate the requirement that any factory built system, per code, **shall be** installed in accordance with the **terms** and **conditions of the listing**, and in accordance with the applicable manufacturer's instructions (all of them must line up; listings, insert, fireplace, piping, and liner).

As part of the listing process UL requires that manufacturers installation instructions are reviewed and that they outline and detail a manner of installation in compliance with the terms and conditions of the listing. One purpose of this is to assure that an installer can install the system in accordance with the tested and listed requirements. Any mention of the manufacturer's installation instructions for factory built systems hereafter in this document should direct the reader's mind back to the specified terms and conditions of the listing. That is where things get a little interesting, as any mention of installing inserts into factory built fireplaces is outside the scope of the listing, and yet also included in the manufacturer's instruction manual.

In the next few pages we will explore some applicable existing codes. Following that we will briefly review the requirements, conflicts, and potential gaps as experienced inside of some existing UL listings. Finally we will individually evaluate and detail specific issues associated with installing an insert into factory built fireplaces and their respective chimney systems.

## CODE REQUIREMENTS

### International Residential Code (IRC) for One and Two-Family Dwellings (2018)

In residential construction everything we do in one way or another comes back to the IRC requirements. Some version of the IRC is adopted as code in all 50 states. The most current code is shown here (2021). We will not explore older versions of the code in this document though many of the requirements listed here have not changed in recent iterations of the code.

- R1004.1 General. Factory-built fireplaces shall be listed and labeled and **shall be installed in accordance with the conditions of the listing**. Factory-built fireplaces shall be tested in accordance with UL127.
  - Please note that there is NO provision in the IRC that allows for the installation of an insert into a factory built system. Under this provision however it could be argued that if the insert were part of the conditions of the original listing of the factory built fireplace it would be permitted. The problem is that currently and historically there is no provision within the listing to test these types of installations. Given this is the case, existing installations already do not and cannot meet minimum code requirements. As inspectors, these installations fail regularly because they cannot meet the basic terms and conditions of their listing.

- M1302.1 Listed and labeled. Appliances regulated by this code **shall be listed and labeled for the application in which they are installed and used...**
  - Neither inserts nor liners are listed and labeled for the applications into which they are currently being installed.
- R1005.1 Listing. Factory-built chimneys shall be listed and labeled and **shall be installed and terminated in accordance with the manufacturer's installation instructions (which come directly from the listing process).**
  - How many factory built chimney manufacturer's instructions permit or detail the possibility of relining through their systems?
- M1801.1 Venting required. Fuel-burning appliances shall be vented to the outdoors **in accordance with their listing and manufacturer's installation instructions...**
- G2422.1.2.3 (411.1.3.3) Prohibited locations and penetrations. Connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.
  - **Exceptions:** Fireplace inserts that are factory equipped with grommets, sleeves or other means of protection **in accordance with the listing of the appliance.**
    - There is no listing specific to this type of installation for an installer or inspector to reference. Manufacturer installation instructions are all we have. But what are they based on?

### **International Mechanical Code (2018)**

This code section is where things get a little gray as some manufacturers have used this to say that is all they have to comply with and effectively disregarded all other code sections, conflicts, discrepancies, or questions that may exist. At this time I am not sure when this came into effect or who added the edit to this section but it still does not match up with other requirements elsewhere in code and may alter the heat signature of the original system.

- M903.1 General. Factory-built fireplaces shall be listed and labeled and shall be installed in accordance with the conditions of the listing. Factory-built fireplaces shall be tested in accordance with UL127.
- M905.1 Fireplace Stoves and Room Heaters. General. Fireplace stoves and solid-fuel type room heaters shall be listed and labeled and shall be installed in accordance with the conditions of the listing. Fireplace stoves shall be tested in accordance with UL737. Solid-fuel-type room heaters shall be tested in accordance with UL1482. *Fireplace inserts intended for installation in fireplaces shall be listed and labeled in accordance with the requirements of UL1482 and shall be installed in accordance with the manufacturers instructions.* New wood-burning residential hydronic heaters shall be EPA Certified.

### **NFPA211 Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances**

The NFPA standards are important as a national standard but may not be recognized officially as code in many areas. Generally if two or more codes conflict the more restrictive of the two codes is recommended.

These excerpts are taken from the 2019 version of the standard.

- 11.1 Factory built fireplaces shall be listed and **installed in accordance with the terms of the listing.**
- 11.1.2 Hearth extensions shall be provided **in accordance with the manufacturer's instructions...**
- 11.1.4 Decorative shrouds at the termination of a factory-built fireplace chimney shall be permitted **only where listed for use with the chimney system, or in accordance with the fireplace manufacturer instructions (which are to be based on the listing).**
- 11.4.1.1 Combustion air ducts for factory-built fireplaces **shall be a listed component of the fireplace and installed according to the manufacturer's instructions.**
- 13.4.6 Existing flue use. **Another solid fuel-burning appliance shall not be installed using an existing flue serving a factory built fireplace unless the appliance is specifically listed for such installation.**
  - Again inserts are not specifically listed or tested for installation in this way and thus cannot meet the minimum requirement of being installed per their listing requirements. Additionally, whether connecting into the factory built flue directly, or relining through it, both options use an existing flue serving a factory built fireplace.
- Listed vs. Aftermarket Components (addition in recent NFPA 211 cycles)
  - 14.7.1.1 **Factory-built chimney components or accessories shall be listed or approved for use with the specific model of factory-built chimney system** if the components or accessories are available.
  - 14.7.1.2 **Factory-built fireplace components or accessories shall be listed or approved for use with the specific model of factory-built system** if the components or accessories are available.
  - 14.7.1.1.1 / 14.7.1.2.1 **If the original manufacturer's listed components or accessories are unavailable**, components or accessories acceptable to and installed by a qualified agency shall be installed in accordance with the component or accessory manufacturer's installation instructions.
    - Please note that this does NOT authorize use aftermarket components that do not have a comparable original component listed with the original system. Thus if the fireplace was not originally listed with glass doors, grates, refractory panels, inserts, or lining systems, similar aftermarket components should not be considered. Note also that while the NFPA211 standard permits this idea of aftermarket parts to be contemplated, the IRC, which is code in all 50 states, does not.

From an inspectors standpoint the sections listed above have broadened the road to approve the use of more aftermarket parts and manufacturers have produced them. These aftermarket parts, whether there was an original component tested with the system or not, were not part of the original testing or listing of the system and as such may alter the factory built system's performance, functionality, heat signature, and safety. This could potentially result in a hazardous situation.

To further illustrate the dilemma that this places on an installer or inspector, who is this 'qualified agency' that determines what is 'acceptable'? The NFPA211 describes a qualified agency as, "any individual, firm, corporation, or company that, either in person or through a representative, is engaged in and is responsible for the connection, venting, installation, inspection, repair, or servicing of heat-producing appliances and who is experienced in such work, **is familiar with all precautions required, and has complied with all the requirements of the AHJ.**" The individuals, companies, and organizations within our industry are required to be familiar with all precautions required and comply with the requirements of the AHJ regardless of the amount of training they have or have not received.

The AHJ has adopted certain codes in their area and require contractors to follow those code requirements, which state that we shall only use listed components with factory built systems, and that we shall install factory built systems "in accordance with the conditions of their listing". Building officials generally defer to appliance manuals as appliances are usually tested and listed for the "application in which they are installed and used". In the case of inserts code officials end up deferring to an appliance manual that is not supported by an appropriate listing. Given this reality, how can these systems be installed and comply with all the requirements of the AHJ, or minimum code requirements? In the end the AHJ is not liable for losses that may occur and installers and manufacturers bear the brunt of that responsibility.

## UL STANDARDS & LISTINGS

In order for a factory built system to be properly installed it must be installed per code in accordance with the terms and conditions of applicable listing(s). Listings allow many things but also provide restrictions and limitations on what is permitted. What is permitted or limited is based on what is or is not included in the testing. Any use, installation, or variation outside of the terms and conditions that are tested and required by the listing is not an approved installation. Installations outside of these minimum requirements become untested, unlisted, and ultimately potentially unsafe and hazardous installations that could lead to performance issues, component malfunction, fire loss, personal injury, or death.

### **UL127 - Factory Built Fireplaces**

This listing tests all factory built fireplaces including their specifically approved chimneys. The testing specifies their installation requirements based on the conditions present during testing and the results of the testing. There is no specific insert test within this standard. There is also not a specific test for the installation of a lining system through these fireplace/chimney components. This listing also only tests to a 1700 degree rating, not the higher 2100-degree HT rating.

### **UL1482, UL737 - Free-Standing Stoves, Room Heaters, Fireplace Stoves**

Listed wood inserts are tested and listed to UL1482 or UL737, or both. These test free-standing room heaters that are not intended for installation into masonry or factory built fireplaces as an insert. These tests are used by manufacturers as it is what is available to them today. Insert manuals state they are listed per UL1482 and 'approved' for installation into factory built fireplaces. This insinuates that UL approves these installations and has tested them as part of the listing process. This provides installers and consumers with a false sense of security.

### **UL907 - Fireplace Accessories**

At one point inserts were being tested under this standard but this has not happened to our knowledge in quite a few years. When it was happening it is our understanding that the inserted appliances that were tested failed, the test structures failed, and that testing was discontinued as a result.

### **UL103,UL103HT - Factory Built Chimneys**

This listing addresses the construction and installation of factory built chimneys with an optional 2100-degree test to achieve the high temp or HT designation. Please note that liners, their installation, removal, service, sweeping, or performance is not evaluated under this standard.

### **UL1777 - Chimney Liners**

This listing covers the installation of metallic and non-metallic liners into existing masonry chimneys only. These are not installed or tested in factory built fireplaces or chimney systems and thus are not listed for such installation. In order for the liner to qualify for its 2100-degree HT designation there must be at least 4" of solid masonry, and an approved insulating wrap. Without the surrounding masonry it is not a 2100-degree HT listed product for application or use within a factory built system.

## EXPLORATION OF CURRENT AND POTENTIAL ISSUES

\*\*\*All of the issues listed below are also shown in short form as "Annex A" at the end of this document.\*\*\*

It is highly recommended that all issues noted below be addressed, explored, probed, analyzed, and mitigated as required to assure the safety of the installer and consumer.

### **NO STANDARDIZED LISTING FOR INSERTED APPLIANCES**

As mentioned several times already, there is no listing or standard that currently addresses, tests, outlines, details, or gives appropriate parameters or minimum requirements for the installation of inserts into masonry or factory built systems.

### **LISTING ISSUES BETWEEN FACTORY BUILT FIREPLACES / SOLID-FUEL INSERTS**

As has been explained above there is a gap in the listings of these products. Installation of an insert, unless specifically listed and tested for installation into the specific factory built fireplace, is not a UL listed or tested system. As there is no testing or listing process that has been standardized and agreed upon to address all known or potential issues they cannot be listed or tested together.

### **LISTING ISSUES BETWEEN FACTORY BUILT FIREPLACES / METALLIC LINERS**

Liners are only tested and listed for installation into masonry chimneys and are not tested or listed for installation into factory built fireplace systems.

### **LISTING ISSUES BETWEEN FACTORY BUILT CHIMNEYS / METALLIC LINERS**

Factory built chimneys and liners are not tested or listed together and any combination thus becomes an unlisted combination of components and no guarantees of safety can be provided to the installer or consumer. This is true of both the UL127 test and the UL103/103HT tests.

### **ALL COMPONENTS NOT LISTED OR TESTED AS A COMPLETE SYSTEM**

Code requirements specify that a factory built system must be composed of tested and listed components. If this requirement is not met, how can we promise with any degree of certainty, based on scientifically verifiable testing data, that a specific installation will not pose a potential safety or fire hazard?

### **2100-DEGREE HT RATINGS FOR METALLIC LINERS**

Per the testing parameters and listing conditions of UL1777 in order to achieve the 2100-degree HT designation the liner must be insulated and be installed inside a minimum 4" masonry chimney structure. The masonry thickness/structure is required for the 2100-degree HT listing to apply. Running UL1777 liners through a factory built fireplace or factory built chimney system does not qualify for the HT designation as it is not installed within the scope, terms, or conditions of the listing. Inserts and modern solid-fuel appliances require a 2100-degree HT flue or liner. At present liners are not an HT product for this application without the minimum required solid masonry thickness and insulation wrap. As mentioned earlier, fireplace and piping systems tested under UL127 are only tested to 1700 degrees.



## **USE OF AFTERMARKET COMPONENTS**

While NFPA211 makes some allowance for aftermarket parts it also specifies that this only applies where original listed components are no longer available, and where installed by a qualified agency. Therefore if an insert was not part of the original listing it is not an option as an aftermarket component per NFPA211. Additionally the IRC, which is code in all 50 states, allows for factory built fireplaces/systems to be installed only in accordance with the terms and conditions of its listing. Only listed components should be used. Aftermarket components cannot meet this final and most basic test. As a result a system using aftermarket components, which would include inserts and liners, cannot be installed in accordance with the terms and conditions of the applicable listings, or code requirements. The safe use of the system can thus no longer be guaranteed and a potential fire hazard exists. Aftermarket components that were not tested or listed with the original system could alter performance, heat signatures, air flow, pressures, or other portions of the system in ways that could lead to fire loss, the personal injury of consumers, and death.

## **REMOVAL OR MODIFICATION OF ORIGINAL LISTED COMPONENTS**

If the fireplace was originally tested in a certain configuration to achieve certain temperature ranges on its components and pass the listing test, couldn't this be altered by removing the factory grate, or other components and installing aftermarket components, in this case an insert and liner, into the system? How can any modifications to an existing system be permitted without retesting when additional components or modifications are outside the scope of the original listing?

## **PRIOR USE OF AFTERMARKET COMPONENTS NOT LISTED WITH SYSTEM**

What happens when aftermarket components, parts, panels, etc... were installed in the fireplace system? Will the use of these components change the heat signature of the system with the newly installed insert when it wouldn't have done so if the original components were still installed? How can we be sure?

## **AGE OF THE BASE FACTORY BUILT SYSTEM**

How can we install a new insert and liner into a factory built fireplace and chimney system that may be 20-30 years old, or older? These factory built systems were designed to last roughly 25 years. Some don't last that long, while others may last much longer. Will these fireplace and chimney systems fail around the insert and liner and pose an increased fire risk over time?

## **BASE FACTORY BUILT SYSTEMS THAT CANNOT BE IDENTIFIED**

When systems cannot be identified we cannot verify whether or not it is installed in accordance with its original listing requirements, its original parts, or per the original manufacturers instructions. Without identifying the fireplace and referencing its proper manual, which results from the listing process, we cannot be sure it is suitable for use as is, let alone with an insert or another appliance installed. Systems that cannot be identified should only be removed and replaced. Anyone desiring to put an insert into systems that cannot be identified will not be able

to install it per the terms and conditions of the involved listings and may cause a hazardous situation.

### **WEIGHT OF THE INSERT OR APPLIANCE**

If a fireplace was not tested to support the weight of an insert how are we in good conscience installing an appliance that over time can and may separate fireplace and piping components? Perhaps it will crush supports beneath the appliance, allowing the insert body closer to the combustible materials beneath the unit than originally anticipated? Or separate fireplace or piping components above, allowing significant heat to enter the chase?

### **WEIGHT OF THE LINER AND TERMINATION TOP PLATE**

Is the weight of the liner substantial enough to cause a problem with the structural integrity of the piping system or structural integrity of the fireplace? Is this different for insulated vs non-insulated liners? Smooth wall versus standard flexible liners? Does the termination method make a difference to the load on the chimney? Which pipe fares better between double wall air cooled, triple wall air cooled, combination piping, or packed piping? Is there a maximum liner length that can be supported by these chimney systems? Was this tested as part of the piping or fireplace listing, especially where maximum chimney heights were given? A 40' liner in a factory built chimney adds substantial weight to a piping system, whereas a 10' liner in a short one story house may not. But how do we know? Does this change the recommended distance between vertical chimney supports and braces? Currently there is no test in the existing UL standards for factory built fireplaces or factory built chimney systems to test this.

### **LINER TERMINATIONS OR CAPS NOT LISTED WITH FIREPLACE**

In general most manufacturers recommend or require in their manuals that if a factory built chimney is relined that the existing termination be used so that the airflow of the system is maintained. Does this apply to the entire cap around the liner and top termination plate? Can insulation be used around the liner to limit airflow or must it be fully secured to the interior of the chimney cap? Can the top half of the cap be removed and a liner cap used if the air channels are maintained with the lower portion of the cap? In a packed piping system can the top be sealed? Will this trap heat around the liner inside of the flue pipe? Will that heat dissipate or escape quick enough through the small gap between the liner and the top plate to prevent overheating of the chimney piping? Or will that heat through the positive pressure generated by the heat of the insert and liner push out of piping seams or fireplace components into the chase/wall cavity? Will this vary between uninsulated, hand insulated, and pre-insulated liners? Without testing on every termination style or design and every possible liner and piping component combination how can we be sure?

### **SHROUD AND CHASE COVER REQUIREMENTS**

Improper shroud and chase cover installations have caused many fires in recent years. As a result code requirements regarding shrouds have become very stringent. The design of shrouds and chase covers can alter the way heat transfers to the chase top as well as change the heat signature of the entire system from the chimney piping down to the firebox itself, especially in the case of air cooled systems. Because of this manufacturers of factory built fireplaces and/or

chimneys have included specific language in their manuals requiring them to meet certain requirements and specifications regarding shrouds and chase covers.

Currently if shrouds are not originally tested, listed and approved with a system during the listing process, shrouds are not permitted at the termination of a factory built system at all. Some have tested general measurements that can be used to construct custom or site-built chase covers. Use of proper sizing or required spacers can affect the ability of this system to protect the structure during regular use or high heat events.

What happens when an insert is installed and fireplace/piping systems require or do not required chase covers to be ventilated, or made to certain specifications? What happens when a shroud is present and miraculously properly installed prior to liner installation? Does the installation of liner/insert change anything? Will the combined system with the insert still pass those same tests with the specific insert installed? Would the minimum required height above the chase cover change given that hotter flue gases are anticipated out of an insert liner than a larger factory built fireplace flue? During normal operation? During an overfire situation? If a shroud or chase cover changes the pressure in the chimney or chase from negative to positive, how much heat will enter the chase through piping seams or fireplace components? How can this be reliably reproduced?

### **HEAT SIGNATURE CHANGES IN BASE FACTORY BUILT SYSTEMS FROM INSERTED APPLIANCES AND LINERS**

Without testing each combination of fireplace, insert, piping, liner, and any other components or configuration issues together how can we guarantee a consumer that the heat signature of the original fireplace or piping system, or its required location in the home, will not be altered? How can we guarantee that the clearances of the fireplace as originally listed are still sufficient as we are installing something that is outside the scope of the original listing, and all testing previously performed? Depending on the size, shape, and configuration of each set of components in series can the original heat signature of a factory built fireplace with an installed insert be reliably tested and verifiably reproduced? If the components are changed, rearranged, or spaced differently will this change the test results? Will this heat signature vary based on internal or external house pressures? Does outside air location matter or change any other variables?

### **REDUCED, INCREASED, OR ALTERED AIR FLOW AROUND THE INSERT AND LINER COMPONENTS POTENTIALLY ALLOW HEAT BUILDUP AND HEAT TRANSFER (POSITIVE OR NEGATIVE PRESSURE)**

While airflow generally flows through the entire firebox and up the full flue area what changes when this air movement is obstructed by the insert itself, the liner, or the insert surround? Will heat build up in these spaces and transfer to combustibles outside the system? Will it dissipate? Will heat move through gaps and cracks in the piping system or around fireplace components where no problem existed before? Will positive or negative pressure change this? Will this alter clearances that were tested under the original listing? How can we know if it is not tested and

listed in combination? Do results change in air cooled versus insulated fireplace or chimney systems? Will internal or external house pressures affect heat migration in these areas?

### **OUTSIDE AIR DUCTING MAY TRANSFER HEATED AIR OUTWARD**

When outside air components are attached to the fireplace they rely on a functioning chimney pulling air through the system. The draw naturally created by the chimney entrains air into the fireplace opening and outside air ducting. If we seal the top of the chimney with a top plate and the face of the fireplace with the insert surround, we may change the pressure in the system and end up sending heated air backward through the outside air ducting into the chase and towards the outside air termination. The duct itself can serve as a conductive/radiant heat transfer agent increasing temperatures on surrounding combustibles. This heat can transfer large amounts of heat to areas only designed to supply combustion air going into the fireplace. These areas will not be rated for heat. How is this addressed?

### **GAS KNOCKOUTS PREVIOUSLY REMOVED FOR AN INSERT OR LOG SET**

Where gas knockouts are present and previously removed, what happens if the gas line is still present and an insert installed? Even if the knockout is properly sealed will the insert touch the pipe and transfer heat directly outside the fireplace to nearby combustibles? Or will it simply transfer the radiant heat of the nearby insert at a slightly lower temperature? If there is a gap around the gas piping where it enters the firebox or it wasn't properly sealed will it spill heat around it into the chase as it can no longer escape out the top of the chimney system? Has the gas line been removed and are knockouts no longer in their factory position? If the gas knockouts are sealed will the sealants hold long term? What material is required? Does this vary between fireplaces and manufacturers? Will this require installers to open the wall and verify where the gas piping runs, how it is installed, and where it is secured?

### **BODY OF THE INSERT TOUCHING THE FACTORY BUILT FIREPLACE AND TRANSFERRING HEAT WHERE IT WAS NOT ORIGINALLY ANTICIPATED**

When and where the insert body touches the fireplace (sides, top, bottom, etc...) will it transfer heat through the metal layers of the fireplace and into combustible materials near the appliance, or touching the standoffs? How can it be guaranteed this will not occur, unless tested in combination?

### **OFFSET ADAPTERS USED AND HEAT SIGNATURE CHANGES ABOVE THE FIREPLACE BODY**

Offset boxes are not listed components and are not insulated as is required of liners under the UL1777 tests. These components get extremely hot when used. Many are adjustable and can leak smoke, heated air, and combustion byproducts into the firebox cavity. When offset adapters are used what changes occur to the heat signature of the fireplace as this focuses a large amount of heat into a horizontal and confined area near the top of the fireplace? Will the framing clearances as tested by the original manufacturer be sufficient? Will standoff locations be sufficient? Does this alter the heat directed towards the back of the fireplace where it is behind the offset box? Will the offset box touch the firebox or smoke chamber and transfer heat directly to the body of the fireplace and into nearby combustibles without the normally present

entrainment air to help cool those components? Will any heated air and combustion byproducts leaked into the firebox be pulled or pushed out of the fireplace or piping system by positive or negative pressure?

### **USE OF OPEN-HEARTH VS EPA CERTIFIED FIREPLACES TO HOUSE INSERT**

There will be a difference between installing an insert into an open factory built fireplace and a gasketed high efficiency fireplace. How is that quantified? What is and is not permitted? Many of the high efficiency fireplaces have secondary burn tubes or air channels designed into them. If these channels are removed, modified, or cut, and an insert and liner installed will those channels now allow significant heat to enter the chase? Or go backward through heat tubes and other components to areas not designed or tested for heat? Doesn't a modification of these reburn / reflective baffle systems constitute a modification from how they were listed or how they may cool themselves? Could this possibly result in a change in the heat signature of the appliance itself? And thus render clearances insufficient?

### **ALTERATION OF AIR COOLED CHANNELS SURROUNDING OR INTEGRATED INTO FIREBOX OR VENTING**

In an air cooled system the air channels cannot be obstructed or changed in any way. Any modification to, or obstruction of, these channels may change the heat signature of the appliance and piping. How can we modify or alter channels that were established to minimum specifications in the original listing process? Are the air channels of an air cooled factory built piping filled with debris, nesting material, the cotton from cottonwood trees, or other materials? Was this verified throughout the system? Will the insert surround block, obstruct, or alter the amount of air that will enter the air cooled system? Unless originally listed with the fireplace, how can we be sure?

### **AIR COOLED CHANNELS ON THE FIREPLACE VERSUS RECESSED INTO THE OPENING**

When looking at how factory built fireplaces are designed within air-cooled fireplace systems there are different design methods. Some use air cooled channels that are on the face of the fireplace body. Others use air cooled channels that are immediately around the firebox and the air inlets/outlets are recessed behind the face of the fireplace. These inlets/outlets may be on the sides, top, or bottom of the firebox, or any combination of the three. An insert with a smaller surround may not cover the air cooling channels on the outside face and edges but would cover air channels that are inside or recessed into the fireplace opening. Will this change heat signatures of the firebox or the cooling ability of the appliance? Alternately, even if no surround is used, will the air heated by the insert still be pulled into recessed air cooling channels and overheat the fireplace?

### **HEARTH / HEARTH EXTENSION PROTECTION R-VALUE AND CONSTRUCTION ISSUES**

Factory built fireplace systems have varied R-value requirements for the hearth extension. Generally the area immediately below these fireplaces can sit directly on wood framing. Most inserts do not test for R-value requirements beneath the fireplace itself. If they test at all they generally only test the hearth extension. Fireplaces require a hearth extension and their requirements range from only have a  $\frac{3}{8}$ " layer of tile or other non-combustible material to an

R-value of 1.06 in general. Inserts that are tested generally have much higher requirements. Some inserts specify what r-value is required for the hearth extension, while others remain silent on the issue. Inserts radiate a substantial amount of heat. Different fireplaces also have different distances from the hearth extension to the firebox floor. This could vary depending on the material used on the hearth (tile, vs stone slab, etc...).

Will various fireplace firebox designs and firebox floor protection/ventilation methods change the R-value required below the fireplace body itself? How will height above the hearth or hearth extension affect the minimum required R-value? Will the radiant and conductive heat of the insert require an actual minimum R-value beneath the fireplace itself? Does how far the insert protrudes in front of the fireplace affect these values?

### **HEARTH PROTECTION BENEATH FIREBOX AREA IN AIR COOLED SYSTEMS WHERE INSERT PROTRUDES IN FRONT OF THE FIREBOX**

The concern here is the radiant heat of the insert body as it protrudes out from the face of the fireplace. In air cooled systems with air channels beneath the firebox if we move directly down at an angle from the insert body we reach the combustibles separated from the bottom of the insert body by the sheet metal surrounding the lower air cooling channels of the firebox. In an air-cooled system there are often only 1-2 sheets of sheet metal at this location separating the insert body from the combustible materials beneath the fireplace body. Will this cause issues?

### **DROPPED HEARTH EXTENSION WITH PROTRUDING INSERTS**

What about when there is a dropped hearth and a framed wall is immediately below and supporting the fireplace? Is it ok to put an insert protruding beyond the face of the fireplace where its radiant heat may reach the framing supporting the fireplace below? What tests this possibility?

### **ANTICIPATED VARIATION IN INSERT DESIGN**

How will changes between insert designs, cooling features, location from which outside air is pulled, location from which air for secondary burn is pulled, air louver sizing/location (if present), extension from the face of the fireplace, etc... Will these design features interact with other system components in various combinations to create hazardous or unsafe situations? Without testing how can this be determined?

### **CHANGING OR OVERRIDING OLDER LISTINGS WITHOUT RETESTING**

How can we override an older listing with a newer one when code very clearly requires we install factory built systems per the terms and conditions of their original and applicable listings? If the new appliance is listed separately we are required to install it only per the conditions of its listing, which do not include installation into this specific fireplace.

### **GOVERNMENT IMMUNITY CODES AND INSTALLERS**

When local city or county inspectors approve an installation it must be remembered that they are generally immune from prosecution from performing inadequate inspections, often including intentional misrepresentation. This depends on the jurisdiction. This leaves installers firmly in

the crosshairs of any litigation that may result. Where inserted appliances are produced and taken to market in a way that leads installers and consumers to believe they are being installed per their listing requirements, when there are no applicable listings in existence, they are being set up for failure before they've even begun.

### **LATENT DEFECT LAWS IN RELATION TO THESE INSTALLATIONS**

Latent defects are deficiencies which are not apparent by reasonable inspection and not noticed until a later date. The issues laid out in this report may not be apparent to the standard installer, building inspector, or the consumer. Any of these three parties noticing these issues on their own may not be a reasonable expectation given all the conflicting information in the industry today. Where does this leave installers and manufacturers when there is a claim or loss?

### **UNLIMITED PERSONAL INJURY STATUTES**

Many states do not limit any personal injury suits that may arise from the use or malfunction of an installed system. There is often no statute of limitations on these types of lawsuits other than a requirement to file within a specified period after an event resulting in injury or death. What are the long term effects of installing inserts into factory built fireplaces? If these installations result in loss and personal injury what will happen if and when it becomes common knowledge that they are not listed under an applicable listing standard and are not installed within the scope of the applicable listing? What will happen to installers and manufacturers in the event of a lawsuit once this is understood?

### **MINIMUM REQUIRED INSPECTIONS (if a standard is found possible)**

What is required? Is a Level II inspection per NFPA211 required at a minimum, AND a Level III inspection as necessary to verify proper installation and that necessary minimum requirements for listing requirements to be met are present? Given all the issues outlined above would constitute a system that is or is not a candidate for installation? How would this be verified? Does the specific factory built fireplace fall within acceptable parameters, or is it outside the scope of what was tested? Is it outside of the terms and conditions of the listing? How is this determined?

### **INSTALLER TRAINING REQUIREMENTS**

Overall, installers in our industry still struggle to install products properly. Many training programs exist and have been created within the industry to help address this issue and mitigate loss of property and life. Given the fact that most installers are not engineers is it reasonable to expect the installer to discern all these issues on site, determine suitability, and potentially find themselves field-engineering a solution to a problem they never should have been in the position to solve? This is a question of engineering, testing, and listing processes, in addition to code development. Installers should provide input in this process, yes... but it is the duty of the manufacturer and the listing agencies to help assure that installers have a product that has been tested and listed, and that they have clear instructions allowing for a safe installation in the end.

If this listing can be created what requirements would there be for installer education, training and certification (if required)? How much training would be required? How long would this training be? When would it be renewed? How often and what would be the requirements for renewal? Would there be requirements to have other certifications, training, or experience? Would installer training requirements be specific per manufacturer? Or industry-wide and standardized? Would this stem from how units were tested? Would this be given by UL, by the ICC, or by another accredited agency separate from the manufacturers to assure long term that its integrity is maintained? Would dealers be required to only allow certified installers to install inserts? Could they then even sell them to homeowners directly? Or would they make agreements not to sell them to other contractors, etc...? What is reasonable to expect of an installer regarding verification of suitability? What is unreasonable to require given most installers are not engineers, and not qualified to make engineering determinations in the field? How would these training requirements be enforced?

### **INSTALLER CERTIFICATION AGENCIES & REQUIREMENTS**

If certification was required, who would write the program, fund it, and maintain it? What authorizing agency would put its stamp on the certification? How often would it be reviewed and updated? What committee would run it? Would this be a paid committee? Would this requirement for installer certification make it into the codes and standards? Would this change the definition of a qualified agency? How will this certification, if required, tie into the new standard?

### **SUGGESTED UPDATES TO NFPA211, IRC, IMC, IFGC**

Following development and acceptance of a fully vetted standard/listing what edits will be needed in these codes and standards to account for this type of installation? How will these be tracked and prepped? Who will be responsible for compiling them? Submitting them during the various revision cycles? Responding to comments? How expansive will they need to be? Will they be specific enough that as jurisdictions across the US adopt the newer versions they will be bound by code to reference the other applicable standards? Or will they be vague enough that they still leave installers unsure regarding the safety of these systems, and the integrity of their listing process? Or that the codes will still conflict with each other?

## **CONCLUSION**

We highly recommend that the issues outlined in this report be explored and addressed to the fullest extent possible by the Task Group moving forward, as well as any other issues that might arise during the development of the proposed standard and with further industry input. If a way forward is discovered we recommend pursuing it only as the science and the future safety of the consumer permits. Until that time we highly recommend that warnings be required in the manuals for these inserted appliances stating that under the terms and conditions of the UL1482/UL737 listings these systems are not approved or listed for installation into fireplaces, especially factory built fireplaces. The applications in which these appliances are installed and used per the listing should be clarified so that installers and consumers can readily identify this gap in listing and testing requirements. We highly recommend that in the meantime the



installation of existing inserts only be continued into properly constructed masonry systems where minimum construction requirements and air space clearances to existing masonry fireboxes, hearths, and hearth extensions have been met (or construction can be adjusted to meet them), or per the conditions as they may soon be tested under in the newly proposed masonry insert standard.

Professionally, we believe in consumer safety first and foremost, followed closely by maintaining the integrity of listed systems as required by code. While interested in the process and possibility of developing a standard, there is some skepticism that the issues associated with this problem can be addressed in a standardized way given the many variables and unknowns both in the systems tested and the environments into which they are installed. As testing agencies, manufacturers, installers, inspectors, and service technicians our standard of care requires us to operate in a way that protects consumers from fire in their home. It demands that we place life and safety considerations first in the standards that we develop and the products that we put into the market.

If there are too many questions that cannot be answered simply, we recommend that we slow down this process, solidify existing listings, clarify what is and what is not within the scope of existing listings, and change how we design appliances to more effectively replace these older factory built systems instead of simply installing an insert and relining a system in an unlisted, untested, and ultimately improper.

If a standard cannot be successfully created then continuing as we are is the easy way, but is it the right way? Doing the right thing is never easy and admitting we were wrong is never comfortable. In the end though, how we proceed may well be an ethical decision.

UL's own slogan is "Empowering Trust". On the UL website's marketing guidelines page we read the following, "UL certification is a valuable marketing tool that tells your customers that your product, process, service or company has successfully met stringent requirements." And yet as an industry we have standardized, normalized, and rationalized installing these systems outside the scope of the 'stringent standards' and 'specific conditions' designed to give consumers faith. If we do not address the issues raised in this document and in any subsequent input received from knowledgeable parties are we really ensuring the safety of families, homes, and businesses that use our products?

Please feel free to contact me directly with any questions,

**Daniel A. Freeman**

The Chimney Doctor, Ltd. / Freeman Fire Inspectors, Ltd. | 970-644-1172  
[dan@freemanfire.com](mailto:dan@freemanfire.com) | <https://freemanfire.com> | <https://chimney.doctor>

NFI Certified Instructor #176537  
NFI Certified Master Hearth Professional #176537  
CSIA Certified Chimney Specialist # 41  
CSIA Certified Chimney Sweep # 9430  
C-DET Certified Dryer Exhaust Technician #1137  
NCSG Certified Master Chimney Professional #225  
NCSG Certified Chimney Reliner #104  
NCSG Certified Chimney Professional #583  
ICC Certified Residential Mechanical Inspector #9688396

## Annex A

### Overall List of Potential Issues

1. No standardized listings for inserted appliances exist (for masonry or factory built systems)
2. Listing issues between
  - a. Factory built fireplaces and solid-fuel inserts
  - b. Factory built fireplaces and metallic liners
  - c. Factory built chimneys and metallic liners
  - d. 2100-degree HT ratings and metallic liners
3. Use of aftermarket components
4. Removal or modification of the original listed factory built components
5. Prior use of aftermarket components not listed with system
6. Age of the base factory built system
7. Base factory built system that cannot be identified
8. Weight of the insert of appliance
9. Weight of the liner and termination plate
10. Liner terminations or caps not listed with fireplace
11. Shroud and chase cover requirements
12. Heat signature changes in base factory built systems from inserted appliances and liners
13. Reduced, increased, or altered air flow around the insert and liner components potentially allowing heat buildup and heat transfer (both positive and negative pressure)
14. Outside air ducting may transfer heated air outward
15. Gas knockouts previously removed for an insert or log set
16. Offset adapters used and heat signature changes above the fireplace body
17. Body of the insert touching the factory built fireplace and transferring heat where it was not originally anticipated
18. Use of open-hearth vs EPA Certified fireplaces to house insert
19. Alteration of the air cooled channels surrounding or integrated into the firebox or venting
20. Air cooled channels on the fireplace face versus recessed into the fireplace opening
21. Hearth / hearth extension protection R-value and construction issues
22. Hearth protection beneath firebox area in air cooled systems where insert protrudes in front of the firebox
23. Dropped hearth extensions with protruding inserts
24. Anticipated variation in insert design
25. Changing or overriding older listings without retesting
26. Government immunity codes and installers
27. Latent defect laws in relation to these installations
28. Unlimited personal injury statutes
29. Minimum required inspections
30. Installer training requirements
31. Installer certification agencies and requirements
32. Suggested edits to NFPA211, IRC, IMC, IFGC