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Details: Additional Materials

(FORM UPDATED: 08/11/2010)

## WISCONSIN STATE LEGISLATURE ...
## PUBLIC HEARING - COMMITTEE RECORDS

# 2007-08
(session year)

# Assembly
(Assembly, Senate or Joint)

# Committee on ... Housing
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* Contents organized for archiving by: Mike Barman (LRB) (Aug/2010)

WHITE PAPER:

# THE REAL IMPACT OF AN ELECTRICAL FIRE

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Low Voltage Distribution Equipment Section

## INTRODUCTION

Despite the best efforts and safety focus of manufacturers, installers and inspectors, home electrical problems caused an estimated 67,800 home fires and $868 million in property losses in 2003, according to recent data from the United States Fire Administration (USFA).[1] The USFA is part of FEMA (Federal Emergency Management Agency) and is committed to reducing the number of deaths and economic losses due to fire and related emergencies. The USFA also reports that electrical fires annually cause an estimated 485 deaths and injure almost 2,300 more individuals.[1] And homeowners aren't the only victims – more than 23,000 firefighters are injured or killed battling residential fires in general.[2]

The tragic loss of human life and injury, as well as extensive property damage, from residential electrical fires is real – with a total annual fiscal impact estimated to be more than $3.4 billion. In fact, overall, residential fires in the U.S. cause 77 percent of the fire deaths; 73 percent of the fire-related injuries; and 54 percent of the total dollar loss.[3] This staggering loss stresses the importance of homeowners taking the proper precautions to safely escape injury once a fire starts. In addition, homeowners should educate themselves about potential life-saving technology that can significantly decrease the chance of an electrical fire starting in the first place.

This is especially important with new home construction, where safety needs to be the number one priority in the home building process. The cost for increased electrical safety is insignificant compared to the damage and tragedy electrical fires cause year after year. Unfortunately, in many cases, home buyers are not presented with safety choices that have the potential to decrease the chance of an electrical fire from occurring. A key step in this process is for builders, electrical contractors, and anyone involved in residential construction to educate the home buyer on potential life-saving tools. The following review highlights the staggering economic impact of fires in the home.

## IMPACT ON RESIDENTS & FAMILIES

Property damage and/or physical and emotional injuries due to electrical fires can be devastating. Every year, electrical fires result in hundreds of deaths, thousands of injuries and hundreds of millions of dollars in property damage. While some fires are caused by faulty products, many more are caused by the misuse and poor maintenance of electrical equipment, incorrectly installed wiring, overloaded circuits and misapplied extension cords.

Electrical fires can also lead to long-lasting emotional distress on children and adults. Fires are unpredictable and uncontrollable, and may provide only seconds to get fellow family members and pets safely outside. During a fire, people often lose all family heirlooms, photo albums and other irreplaceable items.

Once family members actually make it safely outside, they may face additional problems, such as where to find immediate shelter, food and water, money, sufficient clothing, temporary housing and more.

Whether there is minimal damage or a home is completely lost, fires often disrupt a family's routine and its sense of safety. The loss of a home and personal items, can lead to depression and elevated levels of distress. In the aftermath of a fire, families are often burdened with financial hardship and medical problems. It can also be confusing and frustrating to deal with insurance companies and disaster assistance agencies. Overall, the physical and emotional recovery process following a fire can be lengthy.

While no amount of money can account for the loss of a loved one, the United States Consumer Product Safety Commission (CPSC) uses a statistical value per life of $5 million, and according to its so-called Injury Cost Model, the estimated cost of a fire-related injury is about $56,000 per incident.[4] When applying these values to the USFA's data pertaining to the number of deaths, injuries and property damage attributed to electrical fires, the total annual cost of residential electrical fires amounts to approximately $3.4 billion ($2.4 billion in deaths plus $129 million in injuries plus $868 million in property damage). This figure represents the direct costs to residents and homeowners who are victims of residential fires caused by problems in the electrical system. Indirect costs, like insurance issues and temporary housing, often have additional negative effects.

## IMPACT ON FIREFIGHTERS

In addition to significant consequences for the homeowner, electrical fires impact the lives of firefighters who risk injury and possibly death fighting blazes caused by electrical problems. A firefighter's job is dangerous, and each year, thousands are injured while on duty. While information specific to firefighter injuries resulting from residential electrical fires is not available, the most recent data from the USFA reports that 60 percent of all firefighter injuries occur because of residential fires.[2] This amounted to approximately 23,000 firefighter injuries in 2005, which was nearly two and a half times the number of injuries from fighting non-residential fires.[2] The National Fire Protection Association (NFPA) reports that 18 firefighters were killed in 2005 fighting residential fires, accounting for the highest percentage of firefighting fatalities that year.[5]

Additional firefighter deaths occur as a result of job-related chronic illness that develops over long periods of time, such as emphysema or lung cancer. FEMA reports that the most frequent cause of a firefighter's death is stress or overexertion leading to heart attack and stroke.[3] Injuries range from muscular pain, strains and sprains to burns, smoke or gas inhalation. The USFA estimates that one-third of firefighter injuries result in lost work time.[6]

In looking at the overall impact of injuries sustained in fighting fires, a number of direct and indirect costs need to be taken into consideration. Based on reports, direct costs usually include the expenses related to treating and compensating for the immediate injury or illness. All other costs, such as the funding of personal protective equipment and additional staff and training, are considered indirect. Many of these costs are intangible, making them difficult to measure. In fact, according to FEMA, indirect costs may be as much as eight to ten times higher than the direct costs.[3]

However, several organizations have studied the issue and have come up with an estimated impact in dollar figures associated with firefighter injuries. For example, a study prepared for the U.S. Department of Commerce (USDC) in August 2004 estimated the annual cost of addressing firefighter injuries and the efforts to prevent them or reduce their severity to be as much as $7.8 billion per year.[6] This figure was based on workers compensation payments and other insured medical expenses, including long-term care, lost productivity, administrative costs of insurance and others.

This cost estimate didn't figure in additional factors, such as labor costs of investigating injuries and the hours of data collection, report writing and filing. In addition, there also are costs pertaining to what fire departments pay to provide their employees with health insurance coverage, as well as for safety training, physical fitness programs, protective gear and equipment and its maintenance. These cost components alone account for $830 million to $980 million per year, the USDC reports.[6]

Another method to determine the economic impact of firefighter injuries due to residential fires is to use the value the CPSC places on death and injury. Using the CPSC's per-life estimate of $5 million and the per-injury value of $56,000 measured against USFA estimates, the impact in dollar amount is approximately $1.4 billion ($90 million in deaths plus $1.3 billion in injuries). It is important to note that this total does not factor in many of the indirect costs highlighted previously.

## THE OVERALL ECONOMIC IMPACT OF FIRE

No matter how it is examined, the annual direct and indirect costs associated with firefighter injuries total billions of dollars. These estimates confirm that residential fires are a major problem in the United States and have a tremendous negative effect on society. In fact, combined losses from all natural disasters – hurricanes, tornadoes, floods, and earthquakes – represent just a fraction of the losses from fires. This makes fire safety initiatives by both homeowners and homebuilders key to reducing overall death, injury and property loss.

## A NEW SOLUTION

Many devices can be used in the home to reduce the effects associated with electrical and other types of residential fires. While functioning smoke alarms, fire extinguishers and emergency safety ladders increase a family's chances of escaping injury from an electrical fire, other potential life-saving technology, such as arc fault circuit interrupters (AFCIs), can actually help to prevent fires from occurring in the first place.

AFCIs are the next generation in circuit breaker technology and provide a higher level of protection by shutting off the electrical circuit before an actual fire results. The U.S. Department of Housing and Urban Development (HUD) listed AFCIs as one of the many devices that can be used to prevent burns and fire-related injuries.[7] However, the 2008 National Electrical Code is considering expanding its requirements for AFCIs, with the potential to make homes a lot safer. In fact, experts from the CPSC estimate that AFCI protection in circuit breakers could have prevented 50 percent or more of the fires caused by problems in the electrical system.[4]

The costs to homeowners to have builders add additional protection to the home – in the form of AFCIs – is insignificant when compared to the risk of death and injury caused by electrical fires. According to the CPSC, the average professionally installed cost differential between an AFCI and a standard circuit breaker is between $15 and $20. With the average number of circuits requiring AFCIs being 12, this equates to an approximate cost increase of $180 to the homeowner, or .093% of the national average home cost.[8] This cost is much less than some "non-safety related" upgrades that are typical in a new home. Existing homes may also be retrofitted with AFCIs at a reasonable cost, and this step should be strongly considered as homeowners remodel their current electrical system.

## SUMMARY

Despite the best efforts and safety focus of manufacturers, installers and inspectors, various safety and governmental agencies have confirmed the devastating impact residential fires have on homeowners and firefighters. Each year, approximately 68,000 fires caused by problems in a residential electrical system result in thousands of injuries and billions of dollars in overall economic impact. This heavy toll on human life and property provides a clear indication of the need for homeowners to properly protect their home. The key step to decreasing the annual impact of electrical fires begins with the homebuilding process. It is vital that builders, electrical contractors, electrical inspectors and anyone with knowledge of the available solutions who are involved in residential construction recognize the devastating impact on human life and educate the home buyer on the potential life-saving tools that are available. Saving a human life or preventing injury or property loss is well worth the minimal cost of additional electrical fire protection in the home.

## REFERENCES


[1] *On the Safety Circuit: A Fact sheet on Home Electrical Fire Prevention.* United States Fire Administration, 2006.

[2] *Firefighter Injuries. Topical Fire Research Series*, Volume 2, Issue 1, June 2001. United States Fire Administration.

[3] *A Profile of Fire in the United States, 1992-2001*, Federal Emergency Management Agency, Thirteenth Edition, October 2004.

[4] *Economic Considerations – AFCI Replacements.* Memorandum. United States Consumer Products Safety Commission, March 2003.

[5] *Firefighter Fatalities in the United States – 2005.* Fire Analysis and Research Division. National Fire Protection Association, June 2006.

[6] *The Economic Consequences of Firefighter Injuries and Their Prevention.* Final Report developed by TriData Corporation for the United States Department of Commerce, Building and Fire Research Laboratory, National Institute of Standards and Technology, 2004.

[7] *Healthy Homes Issues: Injury Hazards*, United States Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control, Version 3. March 2006.

[8] *Arc Fault Protection: Using Advanced Technology to Reduce Electrical Fires.* National Electrical Manufacturers Association, 2006.



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WHITE PAPER:

# ARC FAULT CIRCUIT INTERRUPTERS EXPANDING HOME SAFETY

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Low Voltage Distribution Equipment Section

## INTRODUCTION

Smoke alarms, fire extinguishers, emergency escape ladders – these are all proven methods for making a quick and safe escape from a fire in the home. However, in addition to these measures, safety experts are looking at new technology "in the walls" to prevent fires from starting in the first place. Arc fault circuit interrupters (AFCIs) -- the next generation in circuit breaker technology -- are one such life-saving tool. Beginning in January 2008, the National Electrical Code® (NEC®) will expand its requirement for AFCIs. The technology has been required in bedrooms since 1999, but the latest edition of the NEC® will expand AFCI use even further to other areas of the home. Experts believe this new requirement will have a significant, positive impact on homeowner safety, and decrease the number of lives lost and injuries that occur in residential fires.

Advanced AFCI technology was developed in response to an identified problem of home fires originating from electrical causes. According to the latest reports from the United States Fire Administration (USFA), electrical problems spark an estimated 67,800 residential fires every year. These fires are responsible for deaths of 485 innocent victims, approximately 2,300 injuries and more than $868 million in residential property damage.[1]

The United States Consumer Products Safety Commission (CPSC) estimates that AFCI technology could prevent more than 50 percent of electrical fires.[2]

## A NATIONALLY RECOGNIZED SAFETY DEVICE

AFCIs first appeared in the 1999 edition of the National Electrical Code (NEC®), which required their use in branch circuits that supply power to receptacle outlets in bedrooms of homes. After further analysis, the 2002 NEC® expanded its requirement for AFCIs to also include all bedroom circuits, including those that supply lighting fixtures, smoke alarms, and other equipment. The 2008 edition of the NEC, which will be published later this year, takes safety a step further by requiring that all new home construction install the technology on other circuits in the home.

Several prominent organizations in the United States have come out in support of the AFCI expansion. In addition to the CPSC and the National Electrical Manufacturers Association (NEMA), the expanded requirements have the support of the U.S. Department of Housing and Urban Development (HUD) and the National Association of State Fire Marshals, as well as home inspectors and fire personnel, who see first hand the significant damage electrical fires cause.

## A TECHNOLOGICAL LEAP FORWARD

AFCI technology provides increased protection over a conventional circuit breaker by detecting a condition known as an "arc fault." Underwriters Laboratories, Inc. (UL), an independent, product safety certification organization defines an arc fault as an unintentional arcing condition in a circuit.

Unlike a conventional circuit breaker, which detects overloads and short circuits, an AFCI utilizes advanced electronic technology to "sense" different arcing conditions. Common household items, such as a motor-driven vacuum cleaner and the motor in a furnace, naturally create arcs when they are operating. Each of these conditions is considered a normal arc, which can also occur when a light switch is turned off.

Arc faults, however, occur from damaged wiring, overheated or stressed electrical cords, worn electrical insulation, wires and/or cords in contact with vibrating metal, damaged electrical appliances and more.

This potentially dangerous condition creates high-intensity heat – which may exceed 10,000 degrees Fahrenheit – resulting in burning particles that can easily ignite surrounding material, such as wood framing or insulation.

AFCIs are designed to recognize when arc faults occur and automatically shut the circuit down before it becomes a fire hazard. Manufacturers of AFCIs test for the hundreds of possible operating conditions, and design each AFCI to constantly discern between normal and dangerous arcs.

## CONTRASTING THE AFCI & GFCI

While AFCIs are visually similar to GFCIs (ground fault circuit interrupters), there is a major difference between the functioning of the AFCI as compared to a GFCI. While AFCIs and GFCIs both offer protection from electrical hazards in the home, each does so in different ways. The function of the GFCI is to protect people from the deadly effects of electric shock that could occur if, for example, parts of an electrical appliance or tool become energized due to a ground-fault. The function of the AFCI is to protect the branch circuit wiring from dangerous arcing faults that could initiate an electrical fire.

AFCIs do not replace GFCIs. The two technologies can co-exist with each other and are a great complement for the most complete protection that can be provided on an electrical circuit.

## TYPES OF ARC FAULT CIRCUIT INTERRUPTERS

AFCIs are intended to mitigate the effects of arc faults by de-energizing the circuit when an arc fault is detected. In 1996, Underwriters Laboratories published UL 1699 – the recognized national standard for AFCIs. UL 1699 covers a wide variety of conditions that may affect AFCI performance, including humidity, unwanted tripping, abnormal operation, voltage surges and more. Each type of AFCI is required to comply with UL 1699,.

There are two types of AFCIs available – branch/feeder and combination. Both types of AFCIs are intended to be installed at the origin of a branch circuit or feeder, such as a panel board. The branch/feeder AFCI provides for detection of arcing faults that can occur line-to-line, line-to-neutral and line-to-ground.

The combination AFCI provides added safety to the home's electrical system by detecting not only parallel arcing, but also series arcing, which is useful in identifying lower level arcing in both branch circuits and power supply cords. The 2005 NEC revised its AFCI requirements to provide for this upgrade in technology. Effective January 1, 2008, combination AFCI protection will be required in all homes.

As stated earlier, an AFCI can be used in conjunction with the GFCI to provide added protection to the home. A common way to provide both types of protection is to use an AFCI circuit breaker and a GFCI receptacle.

## SMALL COST EQUALS BIG PAYOFF

As with any change in the required protection for the electrical system, there have been many discussion and deliberations both for and against arc fault protection being a part of the NEC. Some have argued that the cost of the AFCI is higher than a standard circuit breaker and, as such, it costs too much to provide the increased protection. While there is an additional cost to upgrading new homes from standard circuit breakers to AFCI technology, this cost increase is small. In fact, the CPSC reports the cost difference between a standard circuit breaker and an AFCI can be as low as $15 per unit.[2]

For example, if AFCIs were used on 12 electrical circuits in a new home, the cost increase would be approximately $180, based on converting those circuits from standard to AFCI circuit breakers. This means the cost increase would be approximately one tenth of one percent on the average $193,000 home. When you compare this cost to the billions of dollars of negative economic impact caused by electrical fires each year, $180 is a relatively insignificant price to pay.

Additionally, the cost of adding AFCIs is much less than some "non-safety related" upgrades that are typical for a new home, such as expensive granite countertops and stainless steel appliances.

## THE BOTTOM LINE

Applying technology to improve the electrical safety of the home is a wise investment for both the homeowner and the community at large. Reducing fires of electrical origin and saving lives is an important responsibility of the entire construction and regulatory community. The heavy toll on human life and property from electrical fires provides a clear indication of the need for home builders and contractors to provide consumers with the safest home possible. Educating home buyers on the latest in home protection devices beyond the smoke alarm, emergency ladders, and similar "after the fact" safety devices is the first step in preventing electrical fires. In addition, new home owners should know what options are available in the way of home safety, and are encouraged to ask their builder or electrician about the life-saving capabilities of AFCIs. With the potential to cut the number of electrical fires that occur each year in half, AFCI technology should not be overlooked.

## REFERENCES

[1] *On the Safety Circuit: A Fact sheet on Home Electrical Fire Prevention.* United States Fire Administration, 2006.

[2] *Economic Considerations – AFCI Replacements.* Memorandum. United States Consumer Products Safety Commission, March 2003.

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WHITE PAPER:

# UPGRADING THE HOME: LUXURY vs. SAFETY

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Low Voltage Distribution Equipment Section

## Introduction

Getting a positive return on an investment is often the first thing on people's minds when they think about improving a home or selecting upgrades during the home building process.

However, while granite countertops, heated floors, custom-built kitchen cabinets and other luxury upgrades may generate a good return when it comes time to sell, home owners should take a safety-first approach and consider smart upgrades that actually protect their investment and potentially the lives of their loved ones as well as their own.

For example, a highly effective safety upgrade – an arc fault circuit interrupter (AFCI) – has significant potential to save lives and property from the threat of electrical fires, which each year claim approximately 485 lives and cause $868 million in property damage.[1] This staggering loss stresses the importance of making electrical safety a high priority when upgrading a home.

Experts believe AFCIs will have a significant, positive impact on residential electrical safety, and its cost is relatively inexpensive when compared to the hundreds of millions of dollars spent each year on "non-safety related" upgrades.

## Splurging on Upgrades

Upgrades and options are an integral part of the home building and planning process. In addition to getting a good return on investment, homeowners seek to customize their living space with upgrades that reflect their personality and unique lifestyle needs.

Often times, builders provide new home buyers with a blank canvas from which to create their dream home, offering the opportunity for them to upgrade virtually every element of the house from its standard features.

The results of a 2006 survey of real estate transactions found that the amount spent on options and upgrades during new home construction accounts for a significant percentage of a home's total price. On average, new homes built in the U.S. feature an additional 10 percent in luxury upgrades. The survey found, that in 2005, buyers of new homes with a base price under $180,000 added an average of 7.3 percent in optional upgrades. Homes with a base price of $180,000 to $300,000 spent 9.7 percent and homes with a base price of $300,000 and higher added 11.4 percent in optional upgrades.[2]

For example, in Chicago, an average new home sale in 2005 was $295,246, which included approximately $32,105 in upgrades, or 10.9 percent of the total cost. The following table highlights these percentages in other areas of the country surveyed by iNest.[2]

| Market | Base Price | Total Cost | Upgrade Cost | % of Total Cost |
|---|---|---|---|---|
| Baltimore, MD | $321,426 | $366,314 | $44,888 | 12.3 |
| Charlotte, NC | $197,180 | $219,963 | $22,784 | 10.4 |
| Milwaukee, WI | $279,075 | $301,113 | $22,038 | 7.3 |
| Washington DC | $431,991 | $466,942 | $34,951 | 7.5 |
| Fort Meyers, FL | #212,583 | $250,222 | $37,639 | 15.0 |

(iNest; *2006 Survey of New Home Upgrades)*

Today, many people are upgrading their kitchens and/or bathrooms – popular options include skylights, his/her sinks, granite countertops, wet bars, hardwood and/or ceramic floors, stone fireplaces, arched openings and columns, recessed lighting and a vast array of cabinet selections such as wood finishes, unique door styles, crown molding, roll-out drawers, glass doors and decorator knobs.

Homeowners making these popular upgrades can expect to increase costs by thousands of dollars. For example, upgrading from the standard laminate countertop to granite may cost in upwards of $50 more per square foot, and upgrading a 12'x12' room with hardwood or ceramic flooring is approximately $1,500-$2,000 extra. Also, an upgrade in kitchen cabinets may reach as high as $16,000 for a custom-made design.

The upgrade trend isn't just reserved for the home building process. Each year, billions of dollars are spent on home remodeling. In fact, the National Association of Home Builders's (NAHB's) industry forecast projects that Americans will spend nearly $233 billion on home remodeling in 2007.[3] The NAHB also reports that in the first 12 months after purchasing a newly-built home, owners spend an average of $8,900 to furnish, decorate and improve it.[4]

In relation to those figures, the Home Improvement Research Institute (HIRI) reports nearly 52 percent of all home buyers complete at least one home improvement project within the first year of purchasing a house.[5]

According to HGTV.com, the online version of Home & Garden Television, the "Top 15 Home Updates" are, in order starting with #1: minor bathroom remodel ($10,000); landscaping ($3,500); kitchen remodel ($15,000); exterior updates - vinyl siding, fresh paint ($7,200); attic bedroom conversion ($40,000); major bathroom remodel ($26,000); major kitchen remodel ($43,000); deck or patio addition ($11,000); basement remodel ($51,000); replacement windows ($9,700); family room ($55,000); office conversion ($13,000); living room décor ($1,500); bedroom updates and living room updates ($1,000).[6]

**Immediate Protection**

When deciding on what upgrades to incorporate into the building or remodeling process, safety should be at the top of the list. Many safety upgrades can be made to the house to counter the threat of fire hazards and one important area not to be overlooked is the home's electrical system.

A national survey of more than 75 million Americans found that one out of four home owners never checks for electrical hazards such as overheated cords, overloaded outlets / circuits or other potentially dangerous conditions.[7] These findings stress the importance of making electrical safety a priority in the building and remodeling process.

Functioning smoke alarms and fire extinguishers are a common and effective safety device found in the home, but are there mainly to alert families of a fire and help them escape without injury. Homeowners should educate themselves about other potential life-saving technologies, such as arc fault circuit interrupters (AFCIs), that actually help to prevent fires from occurring in the first place.

Other experts agree. The U.S. Consumer Products Safety Commission (CPSC) estimates that AFCIs could prevent more than 50 percent of electrical fires[8], and the U.S. Department of Housing and Urban Development[9] lists the technology as a key device in preventing burns and fire-related injuries. AFCIs also have the support of the National Association of State Fire Marshals, the National Electrical Contractors Association, the Electrical Safety Foundation International and other prominent organizations.

The technology may soon gain widespread use. In June, the National Fire Protection Association approved the next edition of the National Electrical Code® (NEC®) which makes AFCIs a requirement in many additional circuits throughout new homes. This new 2008 edition of the NEC® will be published in September 2007. Since the 1999 edition AFCIs were previously only required in bedroom circuits, but now the NEC® is taking homeowner electrical safety one step further.

Opponents of AFCIs, including the National Association of Home Builders (NAHB), have argued that the cost of the AFCI is higher than a standard circuit breaker and, as such, it costs too much for the increased protection provided. Others have argued that since it is a relatively new type of safety device, it does not yet have a field proven history on which to base a decision whether to have it installed or not, or in the builders case, whether or not to recommend it to their buyers.

The truth is, when it comes to cost, AFCIs cost much less than many "non-safety related" upgrades that are typical in a new home. In fact, the cost to homeowners to have builders add this additional protection to the home – in the form of AFCIs – is relatively insignificant when compared to the risk of death and injury caused by electrical fires.

A quick survey of hardware stores and "do-it-yourself" home centers (i.e. Home Depot, Lowes) found AFCIs priced in the $30-$35 range and standard circuit breakers priced between $2 - $4. Using the high-end price of $35.00, the cost differential between AFCIs and the standard circuit breaker is approximately $31-$33. According to a September 2006 article in *Electrical Wholesaling* magazine, the average cost of a 2,500 sq. ft house is $192,846.[10] With the average number of circuits requiring AFCIs being 12, this equates to an approximate cost increase of $372 - $396 to the homeowner, or one-fifth of one percent of the national average cost of that 2,500 sq. ft. home.

When comparing these figures to the hundreds of millions of dollars lost in electrical fires each year, saving a human life or preventing injury or property loss is well worth the cost of additional protection in the home, and certainly well worth the investment.

AFCIs can also be retrofitted to existing homes at a reasonable cost, and this step should be strongly considered as homeowners remodel their current electrical system.

**Bottom Line**

Improving your home with a safety-first approach, including an update of the electrical system, not only protects your investment from potential fire, but it may also save the lives of loved ones. Choosing safety over luxury is one area that should not be overlooked. Unfortunately, in many cases, home buyers are not presented with safety choices that have the potential to actually prevent fires from occurring. A key step in the upgrade process is for builders, electrical contractors, and anyone involved in residential construction to educate the home buyer on potential life-saving devices, such as AFCIs.

**References**

[1] United States Fire Administration, *On the Safety Circuit: A Fact sheet on Home Electrical Fire Prevention*. 2006

[2] iNest Realty, *2006 Survey of New Home Upgrades*

[3] National Association of Home Builders, *2007 Industry Forecast*

[4] Wisconsin Builders Association, *Fast Facts on Housing, General Economic Information from the National Association of Home Builders*
http://www.wisbuild.org/wisbuild/resource+center/fast+facts+on+housing/default.asp

[5] Home Improvement Research Institute (HIRI), 2004

[6] Home & Garden Television, *Top 15 Home Updates*
*http://www.hgtv.com/hgtv/pac_ctnt_988/text/0,,HGTV_22056_52571,00.html*

[7] Insurance Agents & Brokers of America (IIABA), News Release: *National survey finds one out of four homeowners never checks for electrical hazards*. 2004

[8] United States Consumer Products Safety Commission, Memorandum: *Economic Considerations – AFCI Replacements*. March 2003.

[9] United States Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control, *Healthy Homes Issues: Injury Hazards*, Version 3. March 2006.

[10] Home builders report most recent quarterly sales down from a year ago, *Electrical Wholesaling Magazine*, September 2006

WHITE PAPER:

# HOME REMODELING & AFCI PROTECTION

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Low Voltage Distribution Equipment Section

## Introduction

Americans spent more than $235 billion on home remodeling in 2007[1], fueled in part by do-it-yourself home centers, television channels devoted to home improvement, and countless numbers of magazines, books and Web sites that cater to this ever-increasing trend. In addition, in the first 12 months after purchasing a newly-built home, owners spend an average of $8,900 to furnish, decorate and improve it.[2]

While many home improvement and remodeling projects can be tackled by the homeowner, some others may call for professional assistance, for example those requiring changes to the home's electrical system. Several electrical-related factors may come into play over the course of a remodeling project, such as the removal and replacement of wiring, addition of electrical receptacles and lighting or an increase in the home's overall electrical capacity. Consideration for each of these factors during the remodeling process will help to guarantee the integrity of the home's electrical system.

Remodeling has a significant impact on the home's overall value. Considering the often high costs associated with many remodeling projects, homeowners should take the extra steps to ensure their homes are appropriately protected by adding electrical safeguards during the remodeling process. One way to do this is by upgrading the electrical system with arc-fault circuit interrupters (AFCIs), an innovative form of circuit breakers designed to detect dangerous electrical conditions that may lead to an electrical fire in the home.

Upgrading to AFCI protection during the course of a remodeling project not only is cost-effective, but also significantly enhances the overall safety of the home.

## Keys to Remember

A national survey of more than 75 million Americans found that one out of four home owners never checks for electrical hazards such as overheated cords, overloaded outlets / circuits or other potentially dangerous conditions.[3] These findings stress the importance of making electrical safety a priority in the remodeling process, where an uncorrected electrical problem can lead to a potentially disastrous situation, such as an electrical fire.

Whether it's tearing down a wall or putting one up, many remodeling projects come with some form of consideration for the home's electrical system, such as adding lighting fixtures, moving wall receptacles or replacing the wiring. With this in mind, homeowners should educate themselves about potential life-saving technology that can significantly decrease the chance of an electrical fire starting in the first place.

## Common Scenarios

The following section reviews three common remodeling scenarios where the home's electrical system may need to be altered in some form. While the complexity of each depends on the construction of the house, an opportunity to install AFCIs exists, and homeowners should strongly consider spending the additional minimal expense to ensure their new investment is further protected.

### 1) Basement Remodel

One of the more popular remodeling projects homeowners undertake is to transform an unfinished basement into additional living space. The average cost to finish the lower level of a house is approximately $59,000.[4] This may include the creation of a 20-by-30-foot entertaining area and a 5-by-8-foot full bath, as well as a partition to enclose an area for storage and mechanical equipment.

Many electrical needs must be addressed for finishing an area. Since basements tend to be dark and gloomy, one of the first steps a homeowner typically considers is to add lighting, which makes a significant difference in the basement's overall feel. Lighting options can include fixtures hung from the ceiling, mounted on walls, table and floor lamps or recessed lighting coming out of a low ceiling. All of these options require alterations or additions to the electrical wiring.

In addition to lighting needs, electrical wiring may need to be installed to accommodate the outlet needs for audio/video equipment. Additional electrical work will be needed for the bathroom, including lighting fixtures and electrical outlets. Also, a homeowner may want to install a wet bar featuring an under-counter refrigerator and other appliances, again requiring additional electrical work.

In other situations, the electrical needs associated with a remodeling project of this magnitude may require the homeowner to install additional circuits to the home's existing load center, which may lead to the installation of an additional sub-panel to accommodate the extra circuit breakers.

As you can see, the amount of electrical work needed for a basement remodel may vary, but it's vital that it's done correctly and safely by a qualified electrician. This common scenario provides an excellent opportunity to increase the level of protection to the home's electrical system. Adding AFCI protection to the circuits that serve the lighting, audio/video and other appliances will provide a safeguard to detect hidden issues such as:

- damaged electrical wire from the installation process
- light fixture or outlet grounding problems that can occur during installation
- potential electrical problems that can be detected with appliances or electronic equipment connected to the circuits in the future

It is important that electrical wiring for AFCIs be correct so that the device works properly and avoids nuisance tripping. Installing a new circuit will eliminate any wiring issues that may have crept in over the years on existing circuits.

2) Attic Remodel

A similar project many homeowners undertake is to convert unfinished attic space into a bedroom or other living area for the home. The average cost for an attic remodel is approximately $47,000.[4] This project would include an extensive amount of work, such as the addition of a bathroom, new windows and closet space under the eaves. Additionally, the homeowner would want to insulate and finish the ceiling and walls, as well as extend the home's HVAC system to the new space.

Many of the same electrical and lighting needs required for a basement remodel would also come into play for this project – the addition of electrical outlets, rerouting wiring from existing load centers and more. As with any project of this magnitude, adding AFCI protection to the electrical system is an element that should be taken into strong consideration as the 2008 NEC would consider this a "living area" that would require AFCI protection.

3) Removing or Adding a Wall

Two other common home remodeling projects homeowners undertake is tearing down a wall to increase the use of a particular living space, or create an entirely different area by putting up a wall. For example, tearing down a wall may open up the living room to the kitchen or the kitchen to the dining room, whereas the addition of a wall may be used to create a home office.

Typically, the wall that will be removed currently houses part of an electrical circuit in the cavity. This can present various problems or decisions, such as rerouting wiring through the ceiling, replacing old wiring, installing new receptacles and/or other factors.

For example, when the receptacle from the wall being torn down is moved, the homeowner may want to move it to one side of the newly open space, or add another receptacle so there is one on each side. This would require rerouting wire from its original source to its new destination, which may result in replacing the wire from the nearest junction or work box with a longer wire that can extend to the new receptacle. The electrician may also have to install two work boxes on either end of the area and purchase more wire to reroute it if a receptacle is desired on either side of where the wall was once located.

In the case of constructing a wall to create a home office, many of the same factors apply. Electrical work may consist of adding outlets and rewiring the room for a computer, fax machine and other electronic equipment, as well as cable and telephone lines.

The cost of electrical work varies on the current condition of the electrical system and scale of the project. Regardless, when electrical wiring is rerouted from one location to another or needs to be replaced entirely, the homeowner should take this opportunity and consider adding AFCI protection to these circuits therefore, protecting their investment in the project.

**AFCI Technology: Worth Every Penny**

Each year, electrical fires claim approximately 485 lives and cause $868 million in property damage. The U.S. Consumer Products Safety Commission (CPSC) estimates that AFCIs, if installed in all homes, could have prevented more than 50 percent of these fires[5]. The U.S. Department of Housing and Urban Development also lists the technology as a key device in preventing burns and fire-related injuries.[6]

The 1999-2005 versions of the National Electrical Code® (NEC®) require that AFCIs be installed in bedrooms during all new home construction. The NEC® is the country's most universally adopted electrical installation code with more than a 100-year track record of providing electrical safety for millions of Americans.

The 2008 NEC® expands its AFCI requirement to more locations in the home. However, AFCIs can also be retrofitted to older homes, where older wiring and outdated electrical work may increase the threat of an electrical fire. Residents considering a remodel, whether large or small, should strongly consider using it as an opportunity to upgrade their homes with the potentially life-saving device, increasing the level of protection to the home electrical system and therefore decreasing the threat of an electrical fire.

In addition, homeowners will find the cost of AFCIs to be less than many "non-safety" related upgrades that are typical during the remodeling process. In fact, the cost of AFCI protection is relatively insignificant when comparing it to other major home remodeling projects where electrical work may play a significant role, and especially when considering the device reduces the likelihood of electrical fires, and their resulting injuries and death.

AFCIs can be found at electrical distributors, hardware stores and home centers across the country for approximately $30-$35 each, not including the cost of installation which is essentially the same as a standard circuit breaker. As you can see from the following table, AFCIs account for a fraction of the total cost of some common remodeling projects, based on adding two AFCI circuit breakers:

| Remodeling Project | Cost | AFCI Unit Cost | # of AFCI Units | Total AFCI Cost |
|---|---|---|---|---|
| Basement | $59,435 | $35.00 | 2 | $70 |
| Home Office | $27,193 | $35.00 | 2 | $70 |
| Attic Bedroom | $46,691 | $35.00 | 2 | $70 |
| Family Room | $27,193 | $35.00 | 2 | $70 |

(Remodeling Cost vs. Value Report 2007)

## Summary

These figures emphasize the relatively low cost of adding AFCI protection to electrical work associated with these common remodeling projects. AFCIs are a technological leap forward in electrical safety, and given the billions of dollars spent each year on home remodeling projects, homeowners should seriously consider taking the extra step and upgrade to this proven safety device.

It's fair to ask the question, if the homeowner is spending x amount of dollars to upgrade a specific area of the home, isn't it wise to take that opportunity to ensure the long-term investment is further protected from electrical arcing conditions that may spark a fire.

**References**

[1] The National Assocaition of Home Builders, *All About the Remodeling Industry* http://www.nahb.org/fileUpload_details.aspx?contentID=86474

[2] Wisconsin Builders Association, *Fast Facts on Housing, General Economic Information from the National Association of Home Builders* http://www.wisbuild.org/wisbuild/resource+center/fast+facts+on+housing/default.asp

[3] Insurance Agents & Brokers of America (IIABA), News Release: *National survey finds one out of four homeowners never checks for electrical hazards*. 2004

[4] Remodeling Magazine, *Cost vs. Value Report 2007* http://costvalue.remodelingmagazine.com/index.html

[5] United States Consumer Products Safety Commission, Memorandum: *Economic Considerations – AFCI Replacements*. March 2003.

[6] *Healthy Homes Issues: Injury Hazards*, United States Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control, Version 3. March 2006.

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