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CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: 18 APR 2003

TO : Susan B. Kyle, Ph.D., EXPE

THROUGH: Warren J. Prunella, AED, EC WJP

FROM : Elizabeth W. Leland, EC EWL

SUBJECT : Ground-Fault Circuit-Interrupters (GFCI's)

Enclosed with this memorandum is a report on ground-fault circuit-interrupters (GFCI's). This report provides information about the market for GFCI's and an estimate of the extent to which GFCI's are installed in American homes. This report is provided for use in the Electrocution Program Evaluation Project.

Ground-Fault Circuit-Interrupters (GFCI's): Market and Use Characteristics

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I. Introduction

The U.S. Consumer Product Safety Commission (CPSC) staff currently is evaluating its activities in the area of electrocution prevention. The purpose of this report is to describe selected characteristics of the market for GFCI's and provide estimates of the number of American homes that may have been originally built with at least one GFCI. The report begins by providing a description of how GFCI's work, the types available on the market, and a brief history of the development of GFCI's. The number of manufacturers, changes in retail prices over time, and sales and installations in American households also are discussed. The extent of use in American homes and in specific locations around the home is estimated, and the socioeconomic characteristics of households that may not be protected by GFCIs are presented. Information for this report was gathered from CPSC files, industry and trade association representatives, private sector market reports, Internet Web sites, and trade literature.

II. Market Characteristics

A. Product Description: How GFCI's Work

The physical nature of electricity is to seek the shortest path to "ground" or to a "reservoir into which it can release its power."[1] Electrical shock occurs when a person directly contacts a source of electricity, such as household electrical current. Electricity then flows from the source through the person to the "ground". Sometimes the shock can be so strong that it leads to death from electrocution.

For people in their homes, the "ground" literally is the earth or the soil around a house. Thus, for example, a person could be shocked or electrocuted if he or she came into contact with electric current from a worn or damaged wire of an electric appliance while standing on a wet floor or while holding onto a metal pipe (water and metal are conductors of electricity). In other cases, if the path to ground were less direct, such as when a person is wearing rubber-soled shoes, then the shock would be less strong.

GFCI's are electronic devices that prevent electrical shock. During normal operation of an electrical appliance, the current flowing through the wire into a GFCI generally equals the flow of the current returning from the GFCI. Sometimes, however, part of the returning current can stray and be diverted through a person's body to the ground (for example, if the appliance's wiring is in poor or damaged condition or if there is water in the appliance's wiring). This can result in electrical shock and, possibly, death from electrocution. A GFCI can detect the imbalances in current flow, and, once the imbalance is detected, the GFCI opens or breaks the circuit so that no electricity can flow

[1] Duane Johnson, "Two Defenses Against Electric Shocks", *Family Handyman*, September 1998, <http://www.findarticles.com/cf_0/m1080/n8_v48/21085838/p1/article.jhtml?term=electricshock>.

through the system, and potential electrical shock or death from electrocution is prevented. [2]

B. Types of GFCI's

There are three basic types of GFCI's on the market for use in residential, commercial, and industrial applications: wall receptacle, circuit breaker, and portable. Depictions of these types of GFCI's are shown in Appendix A.

A wall receptacle GFCI is similar to a common wall outlet and is used in place of the standard duplex receptacle found in homes; it protects any appliance plugged into it or any other outlets that might be connected to it. The wall receptacle GFCI has the same two outlets as common receptacles; in addition, it has two buttons, one with the word "test", the other with the word "reset". [3]

Circuit breaker GFCI's are used in homes equipped with circuit breakers rather than fuses. The GFCI circuit breaker can be used as a replacement for a standard circuit breaker and can be installed in an electrical panel box to protect all receptacles on a particular branch circuit. Some homes are wired so that all bathrooms, for example, are on the same circuit. So, installing a GFCI circuit breaker in the electrical panel box means that multiple GFCI's do not have to be installed. A circuit breaker GFCI serves two purposes: it shuts off electricity when there is a "ground-fault" and will also "trip" when the circuit is overloaded or shorted.

Portable GFCIs are frequently used in construction and in outdoor settings where electric tools and appliances are being used. One kind of portable GFCI "contains the GFCI circuitry in a self-contained enclosure with plug blades in the back and receptacle slots in the front. It can then be plugged into a receptacle and the electrical products are plugged into the GFCI."[4] A second kind is an extension cord combined with a GFCI. The portable-type GFCI can be moved around the house so that GFCI protection is provided to any device or cord set that is plugged into it. [5]

A new type of GFCI just coming onto the market is the "Lockout-Action™ GFCI". This type of GFCI automatically tests the GFCI when the "reset" button is pushed. If the GFCI is damaged or no longer functions as designed, it will not reset. This type of GFCI ensures that power to the GFCI and any connected device remains off.[6]

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[2] The GFCI will break the current when the difference between the amount of current going into the GFCI and that coming from the GFCI is at least five milli-amperes.

[3] One variation of the GFCI receptacle is the combination switch/receptacle outlet. This is used in older homes where, for example, the only receptacle outlet is located in the lighting fixture base above the sink mirror or cabinet.

[4] Underwriters Laboratories Inc., "UL Encourages Use of Ground Fault Circuit Interrupters", Press Release, 2002, <wysiwyg://52/http://www.ul.com/about/newsrel/nrspringgfci.html>.

[5] Earl W. Roberts, Overcurrents and Undercurrents, Mystic Publications, Mystic, Connecticut, c. 1996, describes the appearance of the power supply cord GFCI as looking "like a python which has just eaten a pig".

[6] William and Patti Feldman, "Upscale Wiring Enters Mainstream", *Electrical Contractor*, February 2000, <http://www.ecmag.com/backsearch/results.cfm?mode=full&title+Upscale%20Residential%20Wiring%20

In addition, a combination GFCI/AFCI (Arc-Fault Circuit-Interrupter) recently became available to consumers. The AFCI technology in the unit detects and clears electrical arcs in damaged wiring that can lead to fire, and the GFCI technology protects against electrical shock.[7]

C. GFCI's: Domestic (U.S.) Standards

There are installation and performance standards applicable to the GFCI's that are manufactured and sold in the United States. The standard for installation is the National Electrical Code (NEC). Sponsored and maintained by the National Fire Protection Association (NFPA), it also is known as ANSI/NFPA 70.

The number of locations in the home where the NEC requires GFCI's has expanded over the course of the past three decades. In 1968, GFCI's were required only for underwater swimming pool lights. In 1973, GFCI's were required on outdoor receptacle circuits. Since then, changes have been made to the NEC so that GFCI's currently are required in many locations throughout the house, including bathrooms, garages, kitchens, unfinished basements, crawl spaces and areas around spas, hot tubs, and wet bar sinks.[8] In 1975, there were 11 references to GFCI's in the NEC; by 1993 there were 33.[9] Generally, GFCI's are required in locations where water and electricity are likely to be used in close proximity. Table 1[10] lists the year in which GFCI's were first required by the NEC to be used in various locations around the house, and Appendix B provides more specific information about the NEC's GFCI requirements.

State and local jurisdictions can choose to adopt the NEC in whole or in part and are responsible for enforcement. The NEC reportedly is used in whole or in part in every state of the nation.[11] Every three years, the NEC is revised, and states and local communities can choose to adopt the newest editions of the NEC.[12]

Generally speaking, the NEC is not retroactive. Most local ordinances adopting the NEC provide that installations conforming to the code in effect when the original construction occurred can remain, as long as the installation was not tampered with or altered. Some local codes require that repairs to a residence be made in a way that brings the residence

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Enters%20Mainstream&year=2000&month=02&>. See also Leviton Manufacturing, "GFCI with lockout action", Product Bulletin for Cat. Nos. 8599 and 8899,<http://www.leviton.com/pdfs/lockout.pdf>.

[7] "January 2002 Products of the Week", *Electrical Construction & Maintenance*, January 1, 2002, <http://industryclick.com/magazinearticle.asp?releaseid=9780&magazinearticleid=137669&siteid=13&magazineid=31>.

[8] There are some exceptions to requirements in these areas.

[9] Jack Wells, "Think Like a GFCI", Electrical Construction & Maintenance, May 1, 1995, <http://industryclick.com/magazinearticle.asp?releaseid=2995&magazinearticleid=18453&siteid=13&magazineid=31>.

[10] Earl W. Roberts, op. cit., pp.97-98, Fred Hartwell, "Illustrated Changes in the NEC", *Electrical Construction & Maintenance*, September 1, October 1, November 1, and December 1, 1998 issues, and Noel Williams, "Changes in the 2002 NE Code", *CEE News*, September 1, 2001.

[11] National Fire Protection Association, "New NFPA products enhance use of 2002 National Electrical Code", Quincy, Massachusetts, <www.nfpa.org/PressRoom/NewsReleases/New_products_enhance_use_of_20/new_products_enhance_use_of_20.asp>, January 16, 2002.

[12] Roberts, op. cit., pp. 79-80.

Table 1
NEC Residential GFCI Requirements

Code Edition (Year)	Residential Location or Product
1968	Underwater Swimming Pool Lights
1971	Outdoor Receptacles (effective January 1, 1973)
1971	Swimming Pools: Inside Wall Receptacles
1971	Storable Swimming Pools: Electrical Equipment.
1975	Bathroom Receptacles
1975	Fountain Equipment
1978	Outdoor Receptacles: Grade level Access
1978	Garage Wall Receptacles
1978	Mobile Homes, RV's: Outdoor Receptacles and Bathrooms
1981	Some Garage Receptacles Exempted
1981	Spas and Hot Tubs; Therapeutic Tubs
1984	Electric Swimming Pool Covers
1984	Replacement Receptacles on Branch Circuits
1987	Kitchen:Receptacles w/in 6 ft. of Sink
1987	Basement: At Least One Receptacle
1987	Boathouses of Dwellings
1987	Hydromassage Bathtubs and Components
1987	Portable High Pressure Spray Washing Machines
1990	Crawl Spaces At or Below Grade
1990	"Unfinished" Basements Only
1990	Appliances Subject to Immersion
1990	RV's: Sink, Lavatory Receptacles
1990	Mobile Homes: Sink, Lavatory Receptacles
1990	Portable High Pressure Spray Washing Machines
1990	Replacement Receptacles
1993	Wet Bar Sinks
1993	Spas and Hot Tubs
1993	Replacement Receptacles
1996	All Outdoor Receptacles, incl. Balconies
1996	All Kitchen Receptacles Serving Countertops
1996	Receptacles w/in 5 ft. of Hydromassage Tubs
1999	Field-assembled spa or hot tub; therapeutic tubs. and hydrotherapeutic tanks
1999	Electrically Heated Floor Systems
2002	Portable High Pressure Spray Washing Machines

up to the standards of the current code; generally this is required if repairs total a certain dollar amount or are a certain percentage of the value of the building.[13]

In addition to the code that requires the installation of GFCI's in residential homes, there is a performance standard for GFCI's. That standard is Underwriters Laboratories (UL) standard 943, "Ground-Fault Circuit-Interrupters".[14] The First Edition of UL 943 was published in December 1972. The UL standard addresses design and performance requirements and incorporates various performance tests. Companies can submit their GFCI products for testing and certification to UL 943. The NEC requires that GFCI's be certified and listed.

As noted in Table 1, appliances subject to immersion, such as electric hair dryers, are required to have ground–fault protection. This generally is provided through the use of immersion-detection circuit-interrupters (IDCI's) which are built into the appliance. There is a separate standard for IDCI's; it is UL standard 1664, "Immersion-Detection Circuit-Interrupters".[15] The First Edition of UL 1664 was published in May 1990.

UL also maintains standards that apply to specific electrical appliances, such as UL 859 "Household Electric Personal Grooming Appliances".[16] Companies that want to certify and list their products to the standard must provide ground-fault protection on their appliances, through the use of a GFCI, an IDCI, or an integral protective device. If a GFCI or IDCI is used, it must meet the pertinent UL standard for that product.

D. Brief History of GFCI Development

The father of the GFCI generally is considered to be Professor Charles F. Dalziel of the University of California at Berkeley.[17] After attending a meeting on international electrical safety in Europe in the early 1960's, Professor Dalziel, working with a team consisting of Bill Nestor, Elwood Douglas, and Dick Doyle of Rucker Manufacturing Company, and, in 1961, developed the first electronic GFCI. In 1962, a GFCI was installed in Professor Dalziel's home, providing coverage for the whole house.[18]

At first, the emphasis in the manufacture of GFCI's was on circuit breakers and wall receptacles that incorporated ground fault protection. The first GFCIs were circuit

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[13] W. Creighton Schwan, "Code Comments – 3/1/99", *Electrical Contractor*, March 1999, <http://www.ecmag.com/backsearch/results.cfm?mode=full&title=code%20Comments%20%2d%203%2F1999&year=1999&month=03&>.

[14] Underwriters Laboratories Inc, Northbrook, Illinois, "Ground-Fault Circuit-Interrupters UL943", <http://ulstandardsinfonet.ul.com/scopes/0943.html>.

[15] UL 1664 is a construction and performance standard for immersion-detection circuit-interrupters and covers those devices that interrupt the electric current to an appliance in the event of an electrical immersion of the appliance. It is applicable to cord-connected appliances intended for connection to electrical outlets in the home.

[16] UL 859 is a construction and performance standard for electric personal grooming appliances intended for household use. The scope of the standard includes "hair curlers, hair dryers, combs, brushes, and similar appliances" that are to be used in accordance with NFPA 70.

[17] Roberts, op.cit., p.55.

[18] Idem.

breaker-types and were introduced around 1968. Rucker Manufacturing Company worked with Pass and Seymour Manufacturing Company to develop the first receptacle-type GFCI, and, in 1972, Pass and Seymour introduced and listed the first receptacle-type GFCI.[19] As code requirements increased and as consumers and homebuilders began to purchase GFCI's, the number of companies manufacturing the product proliferated. Also, technical and design advances, such as miniaturization and building GFCI's into extension cords, were made to the basic GFCI. As noted earlier, advances continue in the development of GFCI's.[20]

E. Manufacturers

There are numerous companies that manufacture GFCI's. Included among these companies are large firms that make many types of electrical devices; the manufacture of GFCI's is only a portion of their overall business. Two companies combined hold a very large market share of the industry. One of these companies has been described as manufacturing more than 20,000 types of electrical and electronic components.[21] Switches, sockets, dimmers, decorative wiring devices, electrical boxes, wall plates, controls, time and temperature controls, intercoms, locking plugs, receptacles, and connectors, electrical switches, surge suppressors, lighting controls for residential, commercial, and industrial markets are among the types of products manufactured by these companies. In general, manufacturers of GFCI's are companies of varying sizes that produce a wide variety of products. There are, however, a few companies whose product line is focused on electrical safety products.[22]

As the demand for GFCI's has increased over the years, the number of manufacturers entering the market also has increased. In late 1974, a handful of companies were making GFCI's for the retail, industrial, and commercial markets. In 1978, Dalziel noted that the devices were being manufactured by "a dozen U.S. concerns".[23] Today, about 70 companies (17 foreign and 53 domestic) have products certified to UL 943; most of these companies are manufacturers of GFCI's for all markets (residential, commercial, industrial, and institutional). Another seven companies are listed in the Thomas Register of American Manufacturers as being manufacturers of GFCI's; these companies have Web site or other information to indicate that they make GFCI's. Another 49 companies are listed in the Thomas Register as manufacturers of GFCI's, but no accompanying literature or Web site information is available to confirm this.[24]

F. Purchase Locations

GFCI's are widely available at hardware stores, home centers, drug stores, and mass merchandise stores; receptacle and outlet GFCI's that require installation by a

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[19] Roberts, op.cit., p. 56. Pass & Seymour recently celebrated the 30th anniversary of the GFCI. See <http://industryclick.com/magazinearticle.asp?magazineid=31&releaseid=9897&magazinearticleid=140555&siteid-13>.

[20] Roberts, op.cit., pp. 60ff.

[21] Hoover's Online, <wysiwyg://8/http://www.hoovers.com/co/capsule/6/0,2163,42936,00.html>.

[22] This statement is based on the information available about the companies in Appendix B.

[23] Charles F. Dalziel, "GFCIs & GFRs", *Professional Safety*, November 1978, p.34.

[24] Thomas Register of American Manufacturers, online edition, <http://www.thomasregister.com>. The search words used were: "interrupters:electric" and "interrupters: ground fault circuit".

professional also can be purchased through electrical contractors. GFCI's can be purchased online at various Web sites; some types of GFCI's also are available by bid at auction Websites. Pool and spa suppliers and outdoor products stores sell GFCI's for those products; newly constructed pools and spas generally come with integrated GFCI's.

G. Prices of GFCI's: Changes Over Time

The variety of GFCI products is available to consumers in a wide range of prices. In 1984, *receptacle-type* GFCI's ranged in price from $16 to $35; the average price was estimated to be $20 in a report prepared for CPSC in 1986.[25] In 1991, the price of receptacle GFCI's decreased to between $9 and $20, "with units more commonly being priced in the $10 to $13 range".[26] This decrease over time was attributed to efficiencies realized with production in greater volumes and reduced prices for electronic components. One author attributes the decrease to the NEC 1987 code provision that required GFCI protection for kitchen countertops. Because of wiring considerations, implementation of this requirement meant that one additional GFCI was required in the house; before 1987, all code requirements could theoretically be met by one GFCI. The author notes that this requirement probably doubled or even tripled the market for GFCIs, leading to greater production volumes and reduced prices.[27] Current prices for receptacle type GFCI's, based on Web site information range from $7 to about $15.[28] Figure 1 shows how GFCI receptacle prices have decreased over time, how the price range has narrowed, and how the reported average price also has decreased.

By the early 1990s, *portable plug-in* GFCI's had come onto the market and were priced between $12 and $30. *Portable extension cord* GFCI's ranged in price from $11 to $35, depending on the length of the cord. Short cords (12 to 18 inches) cost approximately $11, while 2 -foot cords were about $20, and 6-foot cords ranged between $25 and $35.[29] Extension cords now are available with various numbers of outlets and in various lengths.

Consumers often have GFCI's professionally installed in older homes that were not built with GFCI protection. A 1999 source states that the cost of an installed GFCI receptacle is about $51; labor costs account for about 25 percent of the total cost of the installed receptacle.[30]

In summary, current prices of GFCI's vary widely. Receptacle-type GFCI's appear to be the least expensive of the three types. A basic GFCI for a residential receptacle costs about $10.

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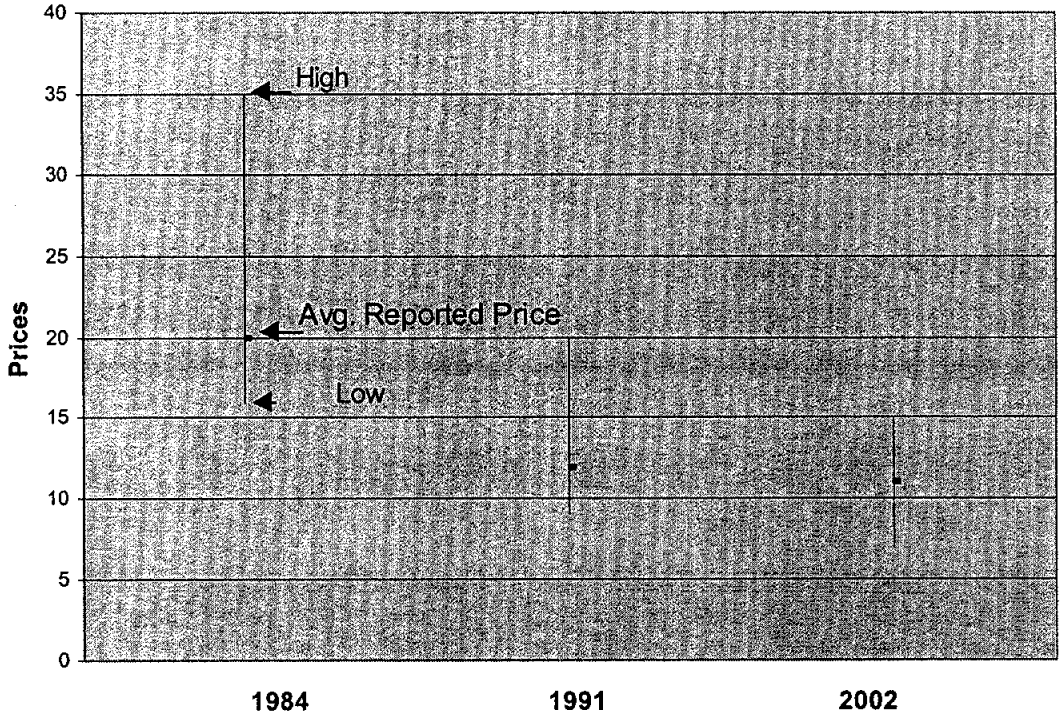
[25] Charles L. Smith, "Costs to Consumers to Install GFCIs", memorandum to A. Albert Biss, ESEE, U.S. Consumer Product Safety Commission, April 22, 1991, p.1.
[26] Idem.
[27] Roberts, op. cit., p 89.
[28] Chat Room, <http://www.todayshomeowner.com/forums/electrical/3080/5.html>.
[29] Charles Smith, op.cit., p.2.
[30] BNi Publications, Inc., Craftsman Book Company, Home Builder's 1999 Costbook, Anaheim, California.

Figure 1
Receptacle GFCI Price Ranges and Average Reported Price
1984, 1991, and 2002



H. Sales/Installation Rates

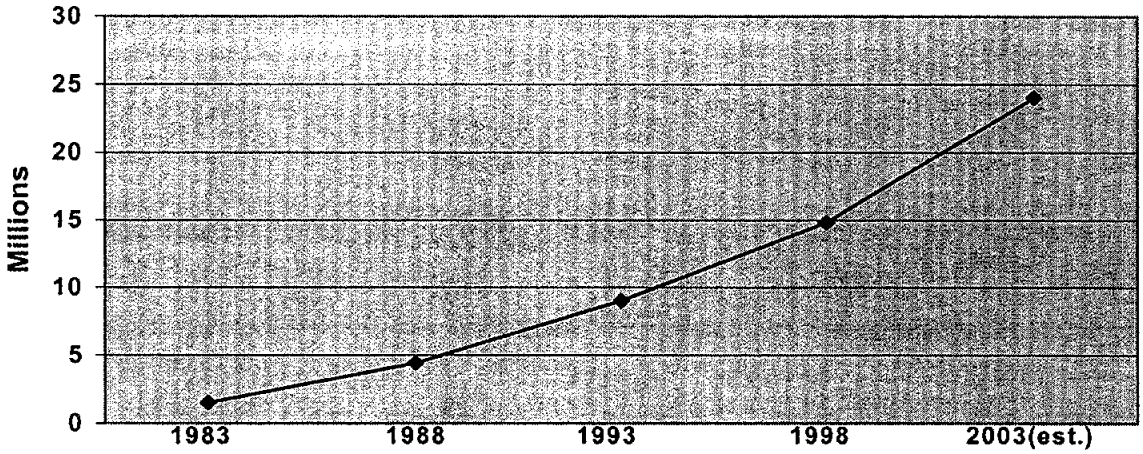
Information about sales of residential GFCI's over time is not readily available. However, a 1994 private-sector market research study indicated that the dollar value of shipments of receptacle GFCIs increased from $30 million in 1983 to $73 million in 1988 to $113 million in 1993. The study also forecast shipment values of $185 million in 1998 and $265 million in 2003.[31]

The average cost of a receptacle-type GFCI at specific times during the past 30 years and the dollar value of shipments can be used to provide a rough estimate of unit shipments. For example, if the average cost of a receptacle-type GFCI is about $10, and the dollar value of shipments is $50 million, then 5 million GFCI's were shipped. Using the price and shipments information described above, EC staff estimates that shipments may have totaled about 1.5 million units in 1983, 4.4 million in 1988, 9.0 million in 1993, 14.8 million in 1998 and could increase to about 24 million units in 2003. Based on these shipment trends, there may have been about 220 million *receptacle-type* GFCIs shipped since 1970.[32] Figure 2 shows the increase in shipments over time. These shipments include not only residential markets, but also commercial, industrial, and institutional markets.

[31] The Freedonia Group, Inc., Electrical Wiring Devices, June 1994, Cleveland, Ohio, p. 69.

[32] These calculations assume that the dollar value of shipments and the unit value of shipments increased linearly during the 1983 – 2003 time frame.

Figure 2
Receptacle GFCI's: Shipments 1983-2003



III. Extent of GFCI Use in American Households

A. Unit Number in Use and Number of Protected Households

A year 2000 press release from the National Electrical Safety Foundation (NESF) says that an estimated 400 million GFCIs have been installed nationwide since the 1970s.[33] In addition, the press release states that these 400 million GFCI's of all types are in about 60 million U.S. households[34] and "many are the standard wall or receptacle-type GFCIs".[35]

Other sources, however, describe a lack of information about GFCI use in American households. One trade publication indicated that information about the number of households using GFCI's was not available.[36] Conversations with a trade association further confirmed that no specific publicly available information about numbers in use is available.[37] The lack of information is complicated by the fact that households can have more than one GFCI. Additionally, while some local jurisdictions enforce the entire NEC, others enforce only a portion of the NEC or enforce earlier versions of the NEC, which required fewer GFCI's. Furthermore, some households use different types of GFCIs that are not required by the NEC, such as outdoor portable GFCI's, and some

[33] National Electrical Safety Foundation, "National Electrical Safety Foundation GFCI Fact Sheet", c.2000, Arlington, Virginia, <http://www.nesf.org/news/gfci_fact_sheet.html>.

[34] "May is National Electrical Safety Month," May 2001, <http://seniorhealth.about.com/library/news/blelecsaf.htm?terms=gfci>.

[35] National Electrical Safety Foundation, op.cit.

[36] Dann Strube, "How Many Homes Have GFCIs?", CEE News, December 2000, <http://industryclick.com/magazinearticle.asp?magazineid=26&releaseid=3433&magazinearticleid=678182&siteid=13>.

[37] Conversation between CPSC staff and economists at the National Electrical Manufacturers Association, Winter 2002.

households, built before GFCI protection was required by the NEC, have added GFCI's to their home through remodeling or repair.

In 1991, in order to estimate the number of households that might be protected by GFCI's, CPSC EC staff collected information about the number of households that were built before and after the NEC required GFCI protection.[38] Using a similar procedure, it is possible to gather information about the numbers of households that may be protected by GFCI's as well as socioeconomic and geographic information about those households. The U.S. Department of Commerce collects information about households through its American Housing Survey (AHS) and the U. S. Department of Energy collects information about households through its Residential Energy Consumption Survey (RECS). Combining these data with information about the specific years when new homes were required to have GFCIs, it is possible to estimate roughly the number of households in the U. S. that may have some level of GFCI protection. However, it must be noted that these estimates do not include the number of households that use portable-type GFCI's (such as for power tools) or the number of older homes that may have acquired GFCI protection through remodeling work.

According to the AHS, there were 102.8 million year-round occupied housing units in the United States in 1999, the latest year for which data are available.[39] The RECS indicates that there were 101.5 year-round occupied housing units in 1997, the latest year for which there are data.[40] These two data sources provide information about various characteristics of American households; some characteristics, such as age of construction are provided by both surveys, but some characteristics, such as number of homes with a garage (sorted by the year of construction) appear in only one of the data sources. As a result, both sources were used as needed in the following analysis.

Table 2 shows the age of 1999 housing units, by year of construction. About 64 million, of the year-round occupied housing units in the United States were built before 1975 and about 38 million were built in or after 1975. If we assume that about 2 million housing units were built during each of the years 1970 – 1974, then, about 43 million housing units were built since 1973, when the first indoor NEC GFCI requirements became effective,[41] leaving about 60 million having been built before 1973. Thus, as many as 60 million housing units may have been built with no GFCI protection at the time of construction; this is about 58 percent of the year-round occupied housing units in the United States today. Some portion of these 60 million homes may, through remodeling and repair, now be protected with GFCI's. Although no historical information about the

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[38] Charles L. Smith, "Numbers of Housing Units Built Before the National Electrical Code Required GFCI Protection", Memorandum to A. Albert Biss, Project Manager, ESEE, CPSC, August 2, 1991.

[39] U.S. Census Bureau, American Housing Survey for the United States:1999, U.S. Department of Commerce, <http://www.census.gov/hhes/www/housing/ahs/ahs99/tab1a6.html>. A "housing unit" is defined as a house, apartment, group of rooms, or single room occupied or intended for occupancy as separate living quarters.

[40] U.S. Department of Energy, Energy Information Administration, A Look at Residential Energy Consumption in 1997, <http://www.eia.doe.gov/emeu/recs/recs97_hc/t1_2a.html>.

[41] As of 1973, the NEC required GFCI's on outdoor receptacles This was the first GFCI requirement within or on the house itself. GFCI's for underwater swimming pool lights were required as of 1968.

number of housing units that have undergone remodeling and repair over time is available, the dollar value of expenditures for remodeling and repair has increased over the past 30 years and has traditionally been a strong component of the housing industry.[42]

Table 2
U.S. Occupied Housing Units, by Year of Construction[43]

Year of Construction	*Number Built (thousands)*	*Cumulative Number Built (thousands)*	*Percent of Total Housing Stock in 1999*	*Cumulative Percent*
1919 or earlier	8,835	8,835	8.6	8.6
1920 – 1929	4,963	13,798	4.8	13.4
1930 – 1939	5,731	19,529	5.6	19.0
1940 – 1949	7,426	26,955	7.2	26.2
1950 – 1959	12,295	39,250	11.9	38.1
1960 – 1969	14,228	53,478	13.8	51.9
1970 – 1974	10,144	63,622	9.9	61.8
1975 – 1979	10,472	74,094	10.2	72.0
1980 – 1984	6,753	80,847	6.6	78.6
1985 – 1989	8,007	88,854	7.8	86.4
1990 – 1994	6,547	95,401	6.4	92.8
1995 – 1999	7,402	102,803	7.2	100.0
Total	102,803	102,803	100.0	100.0

B. Unprotected Households: Socioeconomic and Geographic Characteristics

Additional data from the AHS and the RECS provide some demographic information about the households that reside in the 60 million occupied housing units that were built before 1973, i.e., those housing units that were not built with any level of GFCI protection. Generally, the demographic data show that homes built before the 1973 GFCI requirements were effective have a greater proportion of elderly, below-poverty-level, and minority householders. Of the unprotected housing units (i.e., those built before 1973 when GFCI's were required), about 16 percent are occupied by households with incomes below the poverty level; this compares with 12 percent of protected housing units (i.e., those built after GFCI's were required). Nearly 25 percent of unprotected housing units have a householder who is over 65 years of age; this compares with 15 percent of protected housing units with an elderly householder. About 24 percent of unprotected housing units have householders who are African-American or Hispanic,

[42] This statement is based on data from the Bureau of the Census, U.S. Department of Commerce See "Expenditures for Residential Improvements and Repairs, by Property Type, Quarterly", <www.census.gov/pub/const/C50/histtab2.pdf > and "Residential Remodeling Market Surges As Census Bureau Recomputes Data", National Association of Home Builders, <http://www.nahb.com/news/remodeling.htm>.

[43] The information in this table is based on U.S. Census Bureau, "American Housing Survey for the United States: 1999," op.cit.

while 18 percent of protected households have householders belonging to these ethnic groups.

Geographically, the highest concentration of housing units built before 1973 is in the Northeast. While only 25.1 percent of the housing units in the Northeast are GFCI-protected, 35 to 52 percent of the housing units in the other regions of the country are protected.

More unprotected homes (i.e., those built before 1973 when the GFCI requirements came into effect) are located in the central cities of Metropolitan Statistical Areas, a geographical location defined by the U.S. Bureau of the Census as having at least one urban area with a population of 50,000 or more. Examples of Metropolitan Statistical Areas are Columbus, Ohio; Tampa-St. Petersburg, Florida; Norfolk-Virginia Beach-Newport News, Virginia; and San Antonio, Texas. Nearly 37 percent of the homes built before 1973 are located in the central cities of Metropolitan Statistical Areas, while only 21 percent of the homes built since 1973 are in central cities.

C. GFCI Protection: Specific Household Locations

As can be seen from Table 1 above, GFCI requirements were incorporated into the NEC at different times. Thus, not all homes built after 1973 have the same extent of GFCI protection, i.e., some homes may have more locations with GFCI protection. It is possible, using RECS data, to determine the number of homes that may have partial protection (in terms of current NEC requirements) and the location in the home where that protection likely is present. Table 3 provides information about the locations in the housing unit where protection is most likely to be present. This information is based on the year in which the specific location began to be covered by the NEC requirement and an estimate of the number of housing units that were built after the NEC requirements went into effect. For example, according to the RECS, there are 48.7 million occupied housing units with one-, two-, or three-car garages. About 16.7 million or 35 percent of these were built in or after 1978 and would be GFCI-protected, assuming that all of these housing units were in jurisdictions that enforced the NEC.

Table 3
GFCI Protection: Specific Household Locations
(Based on Housing Units Built after NEC Requirements Became Effective)

Location or Product (Year in NEC)	**Total Protected by GFCI's**	
	Millions	**Percent of Existing Number in Use**
Outdoor Receptacles (1973, 1996)	27.0	35
Garage Walls (1978, 1981)	16.7	35
Bathrooms (1975)	39.2	38
Kitchens (1987, 1990)	15.5	18
Unfinished Basements (1987, 1990)	3.2	10
Crawl Spaces (1990)	2.1	10

IV. Summary

Significant progress has been made in incorporating GFCI protection into American homes during the past thirty years. GFCI's have become more affordable, and more types of GFCI's are available to consumers. An estimated 58 percent of American homes, however, still may not have GFCI protection because they were built before the NEC GFCI requirements became effective. More of these homes, compared to those built after 1973, are located in central cities and have householders who are elderly, of African-American or Hispanic origin, and have below-poverty-level incomes.

The proportion of occupied housing units with GFCI protection is expected to increase. The strength of the remodeling and repair market, the removal of old units from the housing stock, and the expected continued demand for new housing likely will lead to increases in housing units that have some level of GFCI protection.

V. Recommendations

While gathering the above information about GFCI's, it became clear that there is a lack of data specifically related to the number of GFCI's in residences. As a result, EC staff used a proxy (year of housing unit construction) to estimate the number of residences where GFCI's are in use. Using the proxy variable, however, provides only limited information. To gain a better understanding of the number and types of GFCI's in use, it might be useful to consider the following recommendations.

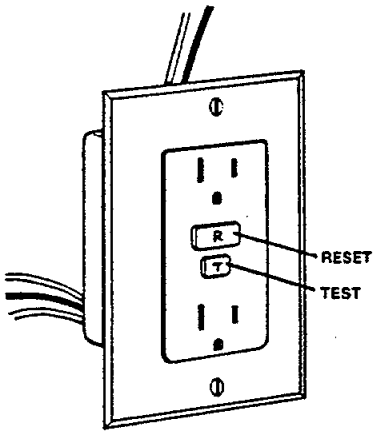
1. It may be useful to explore with DOE or Bureau of the Census the possibility of including in government surveys a question or questions about the use of GFCI's in homes and the age of the homes in which they are in use. Currently, neither the RECS nor the AHS surveys include any questions concerning the installation of GFCI's in households. Yet there are detailed questions concerning various other conditions in homes, such as the number and types of various appliances in the home, evidence of exposed wiring, evidence of broken plaster or peeling paint, and signs of rats in the last three months.

2. It may be useful to develop a list of jurisdictions in the United States that have adopted the NEC and in particular the residential requirements for GFCI's. There does not appear to be any organization that maintains this data in a comprehensive database. Such a database would help in developing a more accurate estimate of the number of housing units covered by GFCI requirements.

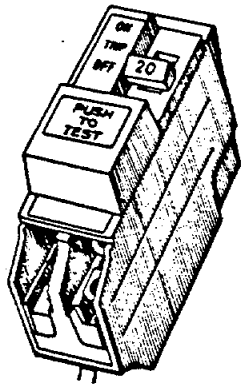
3. It may be useful to review the IDI's related to those electrocution incidents where GFCI's might have prevented the incident. Using zip code and census tract information related to the location of the IDI, it would be possible to determine various socioeconomic characteristics affiliated with the households of the victims. This information may be useful in targeting information and educational materials.

4. It may be useful to conduct a survey to determine the number and types of GFCI's in households as well as usage patterns and extent of consumer knowledge of how GFCI's work.

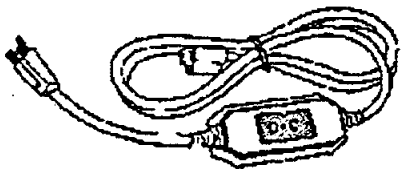
Appendix A
Types of GFCI's



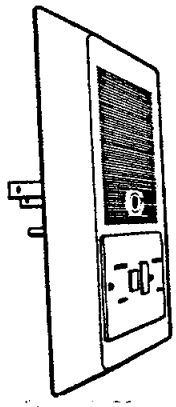
Receptacle



Circuit Breaker



Portable: Cord



Portable: Plug-In

Appendix B
National Electrical Code Requirements
for
Residential Ground-Fault Circuit-Interrupters[B1]

1968

- *Article 680, Section 680-4*
- Underwater lighting fixtures should present no shock hazard either by the design of the fixture or by being protected with a GFCI.
- A definition of a GFCI was included.

1971

- *Section 210-22(d)*
- All 15 A and 20 A receptacles installed outdoors at dwelling-type occupancies required to have GFCI protection, effective January 1, 1973.

- *Section 215-8*
- This section specified that the GFCI protection could be on the feeders supplying 15A and 20 A receptacles, in lieu of the provisions of Section 210-22 (d).

- *Section 680-6*
- No outdoor receptacles should be located within 10 feet of the inside walls of a swimming pool.
- All receptacles located between 10 ft and 15 ft of the inside walls of a swimming pool should have GFCI protection.

- *Section 680-31*
- All electrical equipment used with storable swimming pools should be protected by GFCI's.

[B1] The information for the years 1968 through 1996 is found in Earl W. Roberts, Overcurrents and Undercurrents, Mystic Publications, Mystic, Connecticut, c. 1996. The information for 1999 is from the following articles by Fred Hartwell, "Illustrated Changes in the 1999 NEC – Part 1 of 4", *Electrical Construction & Maintenance*, September 1, 1998; "Illustrated Changes in the 1999 NEC – Part 2 of 4", *Electrical Construction & Maintenance*, October 1, 1998; "Illustrated Changes in the 1999 NEC – Part 3 of 4", *Electrical Construction & Maintenance*, November 1, 1998; and "Illustrated Changes in the 1999 NEC – Part 4 of 4, *Electrical Construction & Maintenance*, December 1, 1998. Information for the year 2002 is from Noel Williams, "Changes in the 2002 NE Code", *CEE News*, September 1, 2001.

1975

- *Section 210-8(a)*
- This section picked up the previous 1968 requirements of Section 210-22(d) for outdoor receptacles and added requirements for GFCI protection of receptacles in bathrooms of residential occupancies
- "Bathroom" was defined.

- *Section 680-41(a)*
- Branch circuits supplying fountain equipment were to be GFCI-protected.

1978

- *Section 210-8(a)(1)*
- GFCI protection was required to be provided at receptacles in dwelling unit garages
- *Section 210-8 (a)(2)*
- GFCI protection of outdoor receptacles at dwellings was required, but only where there was "direct grade level access to the dwelling and to the receptacle".

- *Section 550-6(b)*
- All 15 A and 20 A receptacles installed outdoors and in bathrooms of mobile homes shall have GFCI protection. This was previously assumed to be required through a footnote in Section 550-6(a)

- *Section 551-79 (c)*
- Receptacles in bathroom facilities and outdoors of recreational vehicles are required to have GFCI protection.

1981

- *Section 210-8(a)(2)*
- Two exceptions to the basic requirement for GFCI protection of receptacles in garages of dwelling units were added. One exception was for receptacles that were not readily accessible; this addressed the receptacle over the garage door supplying the automatic garage door opener. The second exception was for appliances occupying dedicated space in garages; this addressed the need to ensure that refrigerators and freezers in garages not trip, leading to food spoilage.

- *Section 680-41(a)(2)*
- Receptacles located within 20 feet of spas and hot tubs must be GFCI-protected.

- *Section 680-62 (a)*
- GFCI protection is required for therapeutic tubs.

- *Section 680-62 (f)*
- All receptacles within 5 feet of therapeutic tubs must have GFCI protection.

1984

- *Section 680-26(b)*
- The electrical supply to motors and controllers of electrically operated swimming pool covers must be protected by GFCI's.

- *Section 210-7(d)*
- This section addresses the replacement of receptacles on branch circuits. Two-wire receptacles are to be replaced by properly grounded 3-wire grounding-type receptacles. However, an exception was allowed: 2-wire receptacles could be used as replacements if a grounding means did not exist in the enclosure. In addition, this section was modified to allow a receptacle type GFCI, provided the GFCI receptacle did not supply other receptacles.

1987

- *Section 210-8(a)(4)*
- At least one receptacle in the basement of dwellings must have GFCI protection.

- *Section 210-8(a)(5)*
- In kitchens of dwellings, all receptacles within 6 feet of the kitchen sink, above counter tops, shall have GFCI protection.

- *Section 210-8(a)(6)*
- Receptacles in boathouses of dwellings must have GFCI protection.

- *Section 422-8(d)(3)*
- The supply cord and internal wiring of portable high pressure spray washing machines must be protected by GFCI's. The GFCI was permitted to be an integral part of the plug.

- *Section 680-70*
- Circuits supplying hydromassage bathtubs and associated components must be GFCI protected

- *Section 210-7(d),Exception*
- The requirement that 2-wire receptacles be replaced with 3-wire grounding type receptacles was revised to allow the GFCI receptacle to supply other receptacles. Grounding conductors were prohibited from being extended to those receptacles.

1990

- *Section 210-8(a)(4)*
- The GFCI requirement for basements was limited to "unfinished" basements, in order to avoid the split-level interpretation issue.

- GFCI requirements were added for receptacles in crawl spaces at or below grade.

- *Section 422-8(d)(3)*
- The requirement for GFCI protection of high pressure spray washing machines was revised to require that the protection be in the plug or within 12 inches of the plug.
- Cord and Plug-connected Appliances subject to immersion were required to have GFCI protection.

- *Section 551-41(c) (2)*
- All receptacles within 6 feet of any lavatory or sink in recreational vehicles were required to be GFCI-protected.

- *Section 550-8(b)*
- All receptacles within 6 feet of any lavatory or sink in mobile homes were required to be GFCI-protected.

- *Section 210-7(d), Exception*
- Exception to the requirement that 2-wire receptacles be replaced with 3-wire grounding type receptacles, properly grounded, was revised. 2-wire receptacles could be replaced by 3 wire receptacles without grounding connections to the grounding terminal, where the receptacles were supplied through a GFCI type receptacle.

- *Section 422-24*
- Cord and plug-connected appliances are subject to immersion. Portable hydromassgae units and hair dryers should be constructed to protect against electrocution when in the "on" or "off" position.

<u>1993</u>

- *Section 210-7(d)*
- GFCI protected receptacles are to be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in the Code.

- *Section 210-8(a)(5)*
- Receptacles within 6 feet of wet bar sinks in dwellings are required to have GFCI protection.

- *Section 680-42*
- Spas and hot tubs and associated electrical components must be GFCI protected, effective January 1, 1994. Previously, only the receptacles for cord- and plug-connected units were required to be GFCI protected..

- *Section 210-7(d), Exception*
- Where 2-wire receptacles are replaced by 3-wire grounding-type receptacles thata re supplied through a GFCI, the receptacle location shall be marked "GFCI-protected".

1996

- *Section 210-8-(a)(6)*
- GFCI requirements for kitchens of dwellings were extended to all receptacles serving counter top surfaces instead of limiting the requirement to those within 6 feet of the kitchen sink.

- *Section 210-8-(a) (2)*
- This section was revised to include the "grade-level portion of unfinished accessory buildings used for storage or work areas" to the requirements for GFCI protection of receptacles in garages or dwellings.

- *Section 210-8-(a) (3)*
- GFCI requirements for outdoor receptacles at dwellings were revised to include receptacles located on balconies of high-rise construction.

- *Section 680-70*
- All receptacles within 5 feet of hydromassage tubs should be GFCI-protected.

1999

- *Section 424-44(g)*
- GFCI protection is required for all electrically heated floor systems in bathrooms and in locations where there are hydromassage bathtubs, spas, and hot tubs, if the floor covering is conductive.

- *Section 680-42*
- A field-assembled spa or hot tub with a heater load of 50A or less must have GFCI protection. Field-assembled units that are three-phase or rated over 250V do not require GFCI protection, nor do units in combination with a pool that share the same bonding grid.

- *Section 680-62(a)*
- A field-assembled therapeutic tub or hydrotherapeutic tank , as well as a self-contained or packaged unit with a heater load of 50A or less, must have GFCI protection.

2002

- *Section 422 – 8*
- High-pressure spray washing machines must be GFCI protected. Protection cannot be in the plug.

Tab F

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

DATE: July 31, 2002

TO: N.J. Scheers, Director, Office of Planning and Evaluation (EXPE)

FROM: Robert Garrett, Electrical Engineer, EXPE
Susan B. Kyle, Ph.D., Management & Program Analyst, EXPE

SUBJECT: Electrocution Reduction Program Activities - Office of Compliance

The Office of Compliance engages in two types of activities in support of the Electrocution Reduction Program: 1.) corrective actions involving products that either violate mandatory standards or present a substantial risk of injury to the public, and 2.) monitoring programs whereby products affected by recently effective voluntary standards are checked to ensure compliance with the standard.

The following table presents the number of corrective actions related to electrocution hazards that were performed for the years 1998-2001 and the number of product units involved in these corrective actions.

Electrocution Reduction Project
Number of Corrective Actions and Number of Products Affected
By Year

		Corrective Actions Section 15 Electrocution or Shock Primary Hazard*	Corrective Actions Section 15 Electrocution or Shock Mentioned**
1998	Number	38	47
	Products	2,136,000	2,313,000
1999	Number	24	51
	Products	1,390,000	3,418,000
2000	Number	21	27
	Products	2,637,000	3,310,000
2001	Number	12	22
	Products	3,482,000	3,982,000

Source: CPSC Section 15 Database, July 29, 2002.
Number: Number of corrective actions
Products: Number of product units involved, rounded to the nearest 1,000.
*The primary hazard associated with the product was described as electrocution or electric shock.
**Electrocution or electric shock was mentioned, but was not necessarily the primary hazard associated with the product.

Corrective Action Plans are documents signed by a manufacturer which set forth the remedial action the firm will undertake to protect the public when a product has been identified as being hazardous or as violating a standard. Corrective actions frequently include such things as repairing or replacing the product, or refunding its purchase price. CPSC may negotiate with a manufacturer to improve the terms of a Corrective Action Plan if a proposed plan does not sufficiently protect the public.

As shown in the table on the preceding page, for the time period 1998-2001, the average number of Corrective Action Plans each year was 37. The average number of products units involved was 3,256,000.

In addition, Compliance also monitors classes of products affected by recent changes in voluntary standards. In 1992, UL addressed shock hazards in personal, hand-held hair dryers by requiring specially-designed safety plugs that disconnected power when the appliances were immersed in water or were damaged enough to allow a shock. Afterwards, when supplies of the old-design hair dryers should have cleared the market, CPSC collected and evaluated hundreds of different hairdryers and negotiated corrective actions by manufacturers and importers whose products we determined to be unsafe.

More recently, after receiving information and advice from CPSC about significant problems with Christmas tree lighting, UL made major changes to its Standard 588 on Temporary Holiday Lighting. UL adopted new requirements that became effective in January 1997 to prevent use of wire size smaller than 22AWG, to address plastic flammability, and to tighten quality control concerning electric shock and fire hazards. In 1999, Compliance conducted a monitoring program, working with the U.S. Customs Service. They stopped non-complying holiday lights at the docks and negotiated recalls of products that had already entered the U.S and been distributed.

In 2000 and 2001 Compliance continued to focus on holiday lights. The CPSC collected 180 samples at retail outlets to evaluate their compliance with the new provisions of UL588 that covered wire size, strain relief and fusing. Fifteen percent of those lacked UL labeling, of which almost 70 percent did not conform when evaluated to a selection of the new UL requirements. Of the majority that had UL markings, 95 percent of them complied with the new standard, according to CPSC's testing.

These efforts produced significant results, identifying large numbers of lights with substantial product defects among the holiday lights that did not carry UL labels or carried counterfeit marking. The risk of personal injury or death resulting from electrical shock and fire is markedly higher when consumers use defective products. Consequently, the staff recommended that CSPC continue to focus future resources on preventing sales of low quality, imported holiday lights that lack proper UL certification.

Tab G

MEMORANDUM

From: Ken Giles, Acting Director
Office of Information and Public Affairs

Becky Bailey, Deputy Director
Office of Information and Public Affairs

To: Robert Garrett
Office of Planning and Evaluation

Date: June 28, 2002

Re: Summary of OIPA's work on electrocution hazards from 1994-2001

Regarding the public affairs component of your report, we are providing more specific information on OIPA's contributions to informing the public about electrocution hazards. We have compiled data, reports, video news releases, publications, press releases, and news articles.

OIPA is not convinced that a nationwide information and education campaign would directly result in a reduction of electrocution deaths. Our experience has shown that certain attitudes shared by consumers – such as, "it won't happen to me" or "I can do this safely even if it's risky" – cannot be overcome by information alone. A lack of knowledge combined with limited access to safety devices and an unwillingness to change unsafe behavior could pose significant challenges to a campaign predicated on reducing consumer deaths. Usually, our information efforts help promote and explain technical changes in the product. We use information to complement the changes in the product. Together, standards and information can help reduce risk.

CPSC Publications:

Publication ID	Description	Quantity Ordered in 2001
016	Extension Cords Fact Sheet	4,633
035	Portable Hair Dryers	946
098	Electric Space Heaters	5,846
099	Ground Fault Circuit Interrupters Fact Sheet	5,180
252	Childproofing Your Home - 12 Safety Devices to Protect Your Children	89,513
253	Thrift Store Safety Checklist	18,136
253S	Thrift Store Safety Checklist (Spanish)	13,820
287	The Dangers of Electric Toys	3,518
463	What You Should Know About Space Heaters	8,447
513	Electrical Safety Room By Room - Audit Checklist	13,380
513S	Electrical Safety Room By Room - Audit Checklist (Spanish)	1,457
516	Repairing Aluminum Wiring	1,815
518	CPSC Guide To Home Wiring Hazards	9,788
524	Electrical Receptacle Fact Sheet	3,188
525	Electrical Heat Tapes Help Prevent Fires (Safety Alert)	1,175
701	Home Safety Checklist/Older Consumers	64,359

OIPA is also responsible for the following Safety Alerts that we frequently update:

- "Electrocution Hazard with Do-It-Yourself Repairs of Microwave Ovens"
- "Metal Ladders and Electricity Don't Mix"
- "New Hair Dryers Prevent Electrocutions"
- "Use a Ground-Fault Circuit-Interrupter With Electric Heaters in the Bathroom"
- "Use a Ground-Fault Circuit-Interrupter With Every Power Tool"
- "Install Ground-Fault Circuit-Interrupter Protection for Pools, Spas, and Hot Tubs"

These Safety Alerts were originally mailed to all media contacts, state/local consumer agencies, the "Safety News" subscriber list, and are currently posted at the CPSC website. OIPA's work to develop, distribute, and update these Alerts should be counted and credited within the report. Consumers today are able to access vital safety information that may have been created in the 1980s, but has been kept current through the efforts of OIPA staff.

Video News Releases:

- Recall Round-Up – CPSC produced several VNRs (1997-1998, 2000-2002) – included b-roll and information identifying hair dryers as a principal hazard – provided electrocution prevention information. The 2001 VNR reached more than 70 million television viewers.
- Faulty Extension Cords – CPSC produced VNR (1999) – showed shock and fire hazards associated with non-testing lab listed extension cords – received an estimated 37 million impressions.
- Wired For Safety – CPSC/NFPA/NIST produced video (1996) – widely distributed video shows specific electrocution and fire hazards such as old wiring, improper insulation, and non-grounded outlets.
- Correcting Electrical Hazards In Older Homes – CPSC produced video in conjunction with NFPA, American Family Insurance, State Farm, ITT Hartford, and Nationwide (1996) – received an estimated 3.2 million impressions.
- Safe Electrical Homes – CPSC produced VNR on aging wiring hazards (1996).
- Home Electrical Wiring – CPSC produced VNR (1995) – discussed CPSC demonstration project to improve older homes, including outlet replacement and correcting of old wiring.
- National Electrical Safety Month – Produced by CPSC in conjunction with NEMA, OSHA, and UL (1994) – featured Richard Karn of Home Improvement and discussed numerous tips for protecting against electrocutions in the home.
- Testing Your GFCI – PSA produced by UL at the urging of CPSC; OIPA edited the script (1993).
- Ground Fault Circuit Interrupters – Produced by NEMA, edited by CPSC (1991).

Press Releases:

- May 2002 – Recognition of National Electrical Safety Month – focused on electrocution from overhead power lines.
- March 2002 – CPSC, ESFI Warn Flood Victims About the Dangers of Mixing Water and Electricity
- December 2001 – CPSC Issues "What's In and What's Out" List for a Safe New Year
- November 2001 – CPSC Releases Holiday Decoration Safety Tips
- May 2000 – CPSC, NESF Urge Consumers To "Plug Into Electrical Safety"
  NESF, CPSC Urge Consumers To "Test and Protect"
- May 1997 – CPSC, NESF Urge Consumers to Plug Into Electrical Safety
- September 1996 – CPSC Offers Free "Home Electrical Safety Kit"
- May 1996 – CPSC Launches Program to Prevent Home Electrical Wiring Fires (in conjunction with NESF, CPSC also distributed a "Home Electrical Safety Checklist")
- May 1993 – Safety Commission Picks Home Electrical System Fires As 1995 Priority

OIPA has also worked with the Office of Compliance on numerous press releases over the past seven years announcing product recalls that presented an electrocution hazard to consumers. Some examples include: hair dryers that lacked immersion protection, power washers with counterfeit GFCIs, Christmas lights and extension cords with poor wiring, and lighting timers and extension cords with reverse polarity.

News Articles:

Numerous wire and print stories from 1994-2002 that mention CPSC and electrical safety are enclosed.

CB Antennas:

OIPA believes that if your report contains death data from the 1970s, then our office's work in the 1970's and 80's concerning antenna safety should be included within the "Alerting the Public" chapter.

- March 1987: Recall announcement of Antron Antenna Research and Electronic antennas that failed to meet the mandatory standard intended to protect consumers from electrocution.
- July 1986: Recall announcement of Jo Gunn Enterprises antennas that failed to meet the mandatory standard intended to protect consumers from electrocution.
- February 1986: Recall announcement of Granada Electronics Inc. antennas that failed to meet the mandatory standard and labeling requirements intended to protect consumers from electrocution.
- April 1984: Recall announcement of Shakespeare Co. antennas that failed to meet the mandatory standard intended to protect consumers from electrocution.
- August 1981: CPSC seeks alternatives to a mandatory rule for CB antennas
- September 1979: CPSC seeks outside expertise for standard development on CB antennas – identifies antennas as the greatest cause of electrocutions and calls for public comments on the proposed standard.
- April 1979: Commission to develop standard on omnidirectional CB antennas – calls for insulation of antennas to protect against contact with high-voltage power lines.
- June 1978: CB/TV Antenna Regulation – calls for the industry to provide safety information to consumers at the point-of-purchase.
- May 1978: Eight killed in CB antenna accidents – provides safety advice from CPSC.
- January 1977: CPSC announces decision on CB base antennas
- October 1977: CPSC proposes labels for CB base and TV antennas
- December 1976: CPSC warns of hazards associated with CB antennas

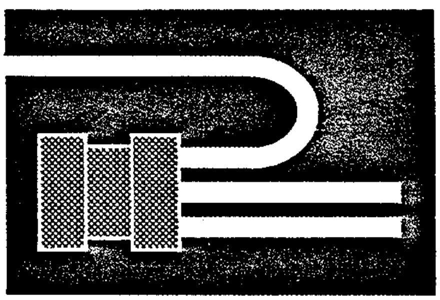
OIPA's position is that the combination of a mandatory standard and information campaign helped reduce the hundreds of deaths from antenna electrocutions that occurred yearly in the 1970's.

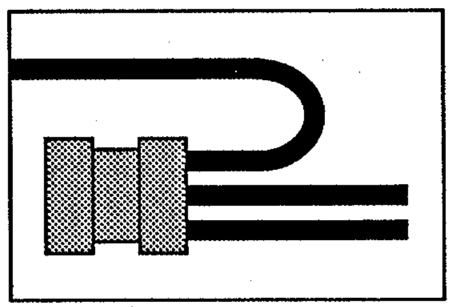
Enclosures: Videotapes, publications, press releases, safety alerts, etc.

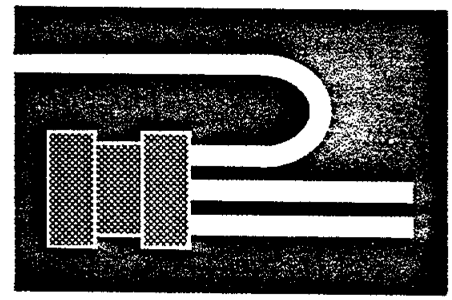
Repairing Aluminum Wiring

CPSC #516

U.S. Consumer Product
Safety Commision
Washington, D.C. 20207







U.S. CONSUMER
PRODUCT SAFETY
COMMISSION
WASHINGTON, D.C. 20207

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

AN EQUAL OPPORTUNITY EMPLOYER

ALUMINUM WIRING

◆ On April, 28, 1974, two persons died in a home fire in Hampton Bays, New York. Fire officials determined that the fire was caused by a faulty aluminum wire connection at an outlet.

◆ Since that tragic accident, the U.S. Consumer Product Safety Commission staff and other government officials have investigated numerous complaints from homeowners throughout the nation who have had trouble with small gauge aluminum branch circuit wiring. The Commission has also had research conducted that shows that homes wired with aluminum wire manufactured before 1972 ("old technology" aluminum wire) are 55 times more likely to have one or more connections reach "Fire Hazard Conditions" [1] than is a home wired with copper.

◆ The hazard investigated by the Commission staff occurs at connections to old technology aluminum wire, such as at outlets or switches or at major appliances such as dishwashers, furnaces, etc. Corrosion of the metals in the connection, particularly the aluminum wire itself, causes increased resistance to the flow of electric current and that resistance causes overheating.

◆ Homes built before 1965 are unlikely to have aluminum branch circuit wiring. Homes built, rooms added, and circuits rewired or added between 1965 and 1973 may contain aluminum wiring.

◆ In 1972, manufacturers modified both aluminum wire and switches and outlets to improve the performance of aluminum wired connections. Sale of the old style wire, switches and outlets still on dealers' shelves however, continued after 1972.

TROUBLE SIGNS

◆ Signs of trouble in aluminum wire systems include warm-to-the-touch face plates on outlets or switches, flickering lights, circuits that don't work, or the smell of burning plastic at outlets or switches. Unfortunately, not all failing aluminum wired connections provide such easily detected warning signs; aluminum wired connections have been reported to fail without any prior indications or problems.

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[1] The survey conducted by the Franklin Research Institute defined "Fire Hazard Conditions" to occur when receptacle coverplate mounting screws reached 149°C (300°F), or sparks were emitted from the receptacle, or materials around the receptacle were charred.

WHAT THE HOMEOWNER CAN DO

◆ If you have noticed any of the trouble signs, have a qualified electrician determine whether the problem is caused by deteriorating connections to aluminum wiring. DO NOT TRY TO DO IT YOURSELF. You could be electrocuted or you could make the connections worse by disturbing them. If you are not certain whether your home has aluminum branch circuit wiring, you may be able to tell by looking at the markings on the surface of the electric cables which are visible in unfinished basements, attics or garages. Aluminum wiring will have "Al" or "Aluminum" marked every few feet along the length of the cable. (Note - the marking "CU-clad" or "Copper-clad" in addition to the "Al" or "Aluminum" means that the cable uses copper-coated aluminum wire and is not covered by this message.)

◆ If you do have aluminum branch circuit wiring, the Commission suggests that you have a qualified electrician check the system for impending trouble. Remember, you may not have noticed any of the warning signs, but research shows that trouble may develop over time and an electrician may spot potential problems before you notice them.

CAN THE PROBLEM BE FIXED?

◆ One method of eliminating the risks associated with old technology aluminum wiring terminations is to eliminate the primary cause: the aluminum wire itself. Depending upon the architectural style of your home and the number and locations of unfinished spaces (e.g., basements and attics), it may be relatively easy to rewire your home. A new copper wire branch circuit system would be installed, and the existing aluminum wire would be abandoned inside the walls. This is the most expensive method of repairing an aluminum wired home; but if you can afford the cost, it is also the best method available.

◆ Since it may be impractical to rewire some types of aluminum wired homes (e.g., condominium units), or since rewiring may be prohibitively expensive for some homes (e.g., split-levels with no unfinished areas), the Commission staff attempted to find a repair method which would permit the continued use of existing old technology aluminum wire. The main criteria to be met by such a repair method are:

◇ It must permit the repair of *every* connection to, or splice between, aluminum wire in the home;

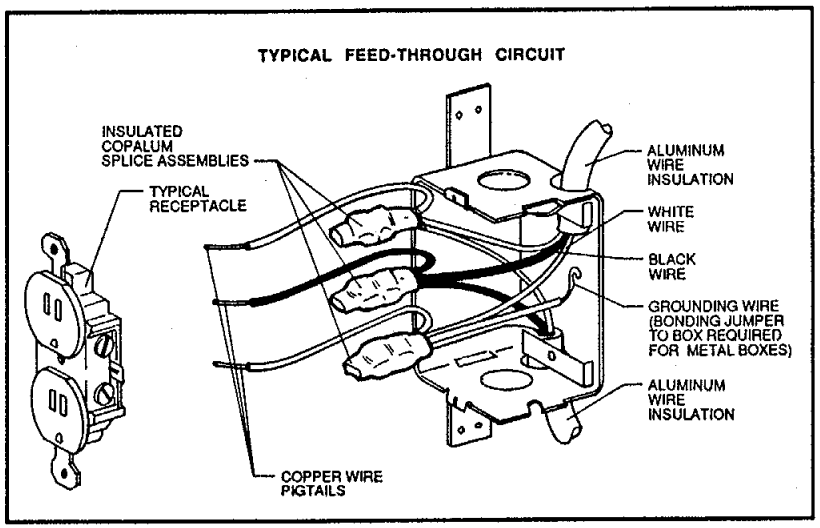
◇ The repaired connections must be permanent but must result in a system that can be maintained without the need for special switches, wall outlets or other connectors;

◇ The repair technique must be practical for use in an occupied and furnished home.

◆ The CPSC-sponsored research, laboratory tests, and demonstration projects identified only one method of repairing existing aluminum wire circuits which meet these criteria. That repair is known as the crimp connector repair.

◆ The crimp connector repair consists of attaching a piece of copper wire to the existing aluminum wire branch circuit with a specially designed metal sleeve and powered crimping tool. The metal sleeve is called a COPALUM parallel splice connector and is manufactured only by AMP Incorporated. This special connector can be properly installed only with the matching AMP tool. This tool makes a permanent connection that is, in effect, a cold weld. An insulating sleeve is placed around the crimp connector to complete the repair.

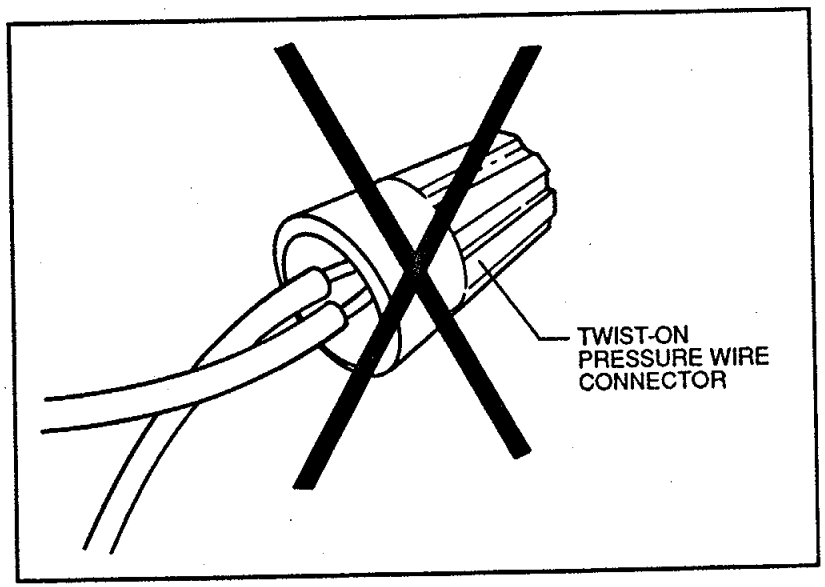
Recommended COPALUM Crimp Connector Repair



◆ Two other repair methods are often recommended by electricians. While these repair methods are substantially less expensive than COPALUM crimp connectors, neither of these repairs is considered acceptable by the Commission staff.

◆ The first repair ("pigtailing") involves attaching a short piece of copper wire to the aluminum wire with a twist-on connector sometimes called a wire nut; the copper wire is connected to the switch, wall outlet or other termination device. The Commission staff has evaluated the effectiveness of "pigtailing" as a repair. In CPSC-sponsored laboratory testing some brands of twist-on connectors have performed very poorly. Over time, substantial numbers of these connectors have overheated in laboratory tests. Surveys of and statements made by electricians and electrical inspectors confirm the highly variable and often poor performance of these connectors when used with old technology aluminum wire. It is possible that some pigtailing "repairs" made with twist-on connectors may be even more prone to failure than the original aluminum wire connections. Accordingly, the Commission staff believes that this method of repair does not solve the problem of overheating present in aluminum branch circuits.

"Pigtailing" Is Not a Recommended Repair



◆ The other repair recommended by the industry uses switches and outlets labeled "CO/ALR". Underwriters Laboratories Inc. (UL) lists these devices especially for use with aluminum wire, although they can be used with copper or copper-clad wire. CO/ALR devices perform better with aluminum wire when installed carefully and according to best electrical practices than do the types of switches and

outlets usually used in the original installations of old technology aluminum branch circuit wiring. However, CO/ALR connectors are not available for all parts of the wiring system (for example, for permanently-wired appliances and ceiling mounted light fixtures). In the opinion of the Commission staff CO/ALR devices must be considered to be, at best, an incomplete repair. Further, CO/ALR wiring devices have failed in laboratory tests when connected to aluminum wire typical of that installed in existing homes. The test conditions simulated actual use conditions; no "overstress" type of testing was used.

◆ Exception: If you have an aluminum wire termination in your home which exhibits symptoms of failure, twist-on connector pigtails or CO/ALR devices may be used as an emergency temporary repair for a failed aluminum termination. Should such a repair be performed, the Commission staff recommends that you arrange to have your home rewired or the COPALUM crimp connector repair performed as soon as possible.

◆ It is important to note that there is only one manufacturer of the special connectors and the tools required to make the repairs as recommended by the CPSC staff.

WARNING

◆ There are many other brands and types of crimp connectors - including those intended to be installed with a pliers type of handtool - which are readily available to consumers at hardware stores, lumber yards, hobby supply stores, automotive supply stores, and so forth.

THE COMMISSION STAFF DOES NOT BELIEVE THAT THESE COMMON VARIETIES OF CRIMP CONNECTORS CAN BE USED TO RELIABLY REPAIR ALUMINUM WIRING.

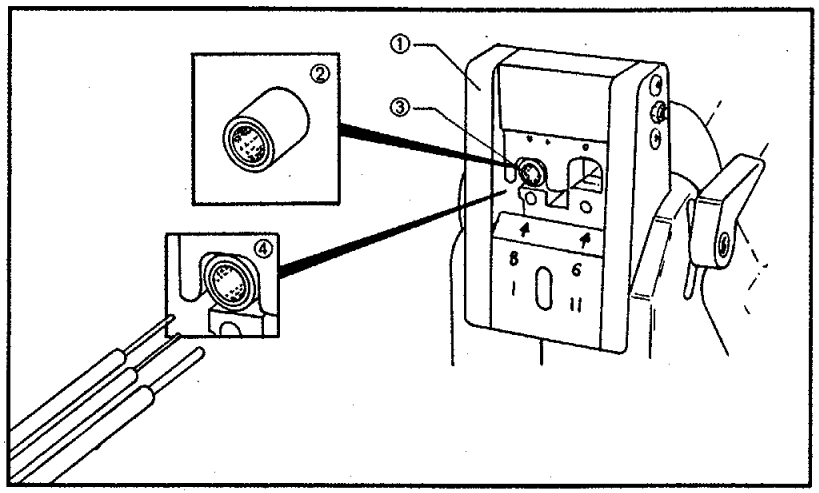
THE COPALUM CRIMP METHOD OF REPAIR

◆ The precision dies in the COPALUM tool squeeze the connector and wires into a particular shape which was determined during the design of the COPALUM wire connector. Both the final shape of the connection and the amount that it is squeezed (deformed during crimping) are critical in making a reliable crimp connection. Upwards of 10,000 pounds of force is necessary to obtain the amount of deformation for which the connector is designed.

◆ In addition, electricians who are authorized to install COPALUM connectors are thoroughly trained by the manufacturer to use the tool properly. The Commission staff emphasizes that this training is

necessary to assure that the electrician uses the careful, professional workmanship required to make the crimp connector repair safe and reliable.

How the COPALUM Crimp Method Works



CRIMPING PROCEDURE

Follow the procedure below with attention given to steps 1 thru 4.

(1) Use the correct tool and dies (recommended by the AMP field representative) for the splice being crimped. Ensure that the color coding and marking designation on the splice correspond to the color coding and marking designation on the tool.

(2) Be sure the perforated liner is inside the splice. The ends of the liner are flared to prevent removal.

(3) Load the splice into the dies of the tool.

(4) Insert stripped wires into the splice until the ends of wires extend beyond end of the splice. Wires should be parallel in the splice. Insulation of the wire MUST NOT ENTER the splice.

◆ You should request a copy of AMP literature from your electrician prior to his beginning work. Discuss with your electrician any information in the literature which you do not understand. Remember, every connection of aluminum-to-aluminum or aluminum-to-copper

wire in your home should be repaired in order to obtain the maximum benefit from such repair work.

◆ All appliances connected directly to #12 or #10 AWG aluminum branch circuit wiring (for example, dishwashers, cooking equipment, heaters, air conditioners and light fixtures) must be repaired in addition to wall outlets, switches, junction boxes and panel boxes.

◆ To determine whether the COPALUM crimp connection method of repair is available in your area, you may wish to write or call the manufacturer of the COPALUM connector for a list of authorized electricians who are doing aluminum branch circuit repair work in your area. You may write to:

AMP Incorporated
Attn: Aluminum Wire Repair Program
Mail Stop 140-13
P.O. Box 3608
Harrisburg, PA 17105-3608
PHONE: 1-800-522-6752

◆ The Commission staff wishes to remind you that all modifications and additions to your wiring system should be done in accordance with local regulations and inspected by municipal authorities. You should insist that repairs to your aluminum wiring be inspected.

ELECTRIC SPACE HEATERS

FACT SHEET

Publication #98

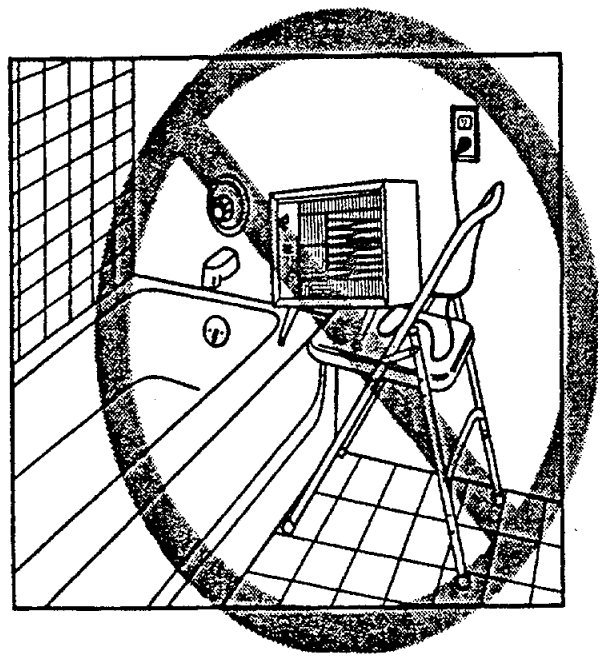
THE STATISTICS

The U.S. Consumer Product Safety Commission (CPSC) estimates that in 1994, electric space heaters were associated with 2,400 fires resulting 80 deaths, 240 injuries and $48.2 million in property loss.

THE PROBLEM

Even though electric space heaters don't have an open flame, the heating elements of some types of electric heaters are hot enough to ignite nearby combustibles like draperies, paper, clothing, furniture, and flammable liquids. It is, therefore, important to check surrounding objects periodically to see if they feel hot. Refer to the manufacturer's instructions to see how far the heater should be placed from combustible materials, and for how far the heater should be placed from the floor so that carpeting or flooring materials don't ignite.

Additionally, to prevent electrocutions, always keep portable electric heaters away from water; never use them in a bathroom or near a sink. (If you must use an appliance near water, always use a ground fault circuit interrupter.)



SAFETY TIPS

CPSC recommends the following when selecting an electric heater:

- Look for one that is listed with a nationally-recognized testing laboratory. These heaters have been tested to meet specific safety standards, and manufacturers are required to provide important use and care information to the consumer. On heaters that are not listed, consumers have less assurance that the safety features and operating instructions are adequate.

- Purchase a heater with a guard around the heating element. A wire grill or other protection is essential to keep fingers or fabrics from touching the hot element. Portable electric heaters that heat by circulating oil or water, however, usually have lower surface temperatures and may not need guards.

- Before using the heater, read and follow the instructions for its operation and maintenance.

- If you must use an extension cord, make sure it is a heavy duty cord marked with a #14 gauge or larger wire. An incorrectly- sized cord may create a fire hazard. If the heater's plug has a grounding prong, use only a grounding (three-wire) extension cord.

- Never run the heater's cord (or any cord) under rugs or carpeting.

- Do not leave the heater operating unattended or operating while sleeping. Portable electric air heaters are designed for use only as temporary supplemental heating and only while attended.

- To prevent electrical shocks and electrocutions, always keep portable electric heaters away from water. And never touch an electric heater if you are wet.

U.S. CONSUMER PRODUCT SAFETY COMMISSION

Washington, DC 20207

SAFETY TIPS (cont'd.)

- Do not use an electric heater as a dryer by placing clothing over it and never use it heater to thaw pipes.

- Keep the heater in safe working condition. Replace missing guards and controls at once. Never operate a defective heater.

- Don't place the heater where children might play near it or where people might trip over or bump into it.

- Place the heater on a level surface for stability.

- Regardless of the type of heating system you have, install and maintain at least one smoke detector that is in good working condition on each floor of your home.

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Tab H

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: July 15, 2002

To: N.J. Scheers, Ph.D., Director
Office of Planning and Evaluation

From: Robert Garrett, Office of Planning and Evaluation RG

Subject: Other Communication Resources Related to the Electrocution Reduction Program

This memorandum provides a summary of activities in support of the Electrocution Reduction Program by each of four information resources - the CPSC Web site, the hotline, the Consumer Product Safety Review, and the National Injury Information Clearinghouse.

CPSC's World Wide Web site (www.cpsc.gov) is an interactive resource that consumers and others may use to report problems with products and to receive general safety information, statistics, recall announcements and other agency publications. The site has enjoyed significant growth since its 1996 inception, increasing from half a million contacts in 1996 to 6.3 million in 2001. The web site also received top ranking in a major study of e-government web sites in 2000: researchers at Brown University evaluated over 1,800 state and federal web sites and named CPSC one of three federal agencies tied for first place. A recent study released by the Department of Commerce[1] showed that last year the percent of Americans who had access to computers connected to the Internet passed the 50% mark. The study also noted the "digital divide", i.e. that the percentage of families lacking a digital connection increased as income and education levels decreased and as age increased.

Table 1 on the following page shows a web page giving consumers quick access to electrical safety publications. Many of the documents relate directly to personal safety and preventing electrocution. During the calendar year 2001, there were an average of 3600 downloads or views of the documents listed on this web page each month. The two most frequently accessed of these documents were the Home Wiring Hazards booklet (1700 downloads) and the Repairing Aluminum Wiring Booklet (760 downloads). These two documents together accounted for two-thirds of the downloads.

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[1] "A NATION ONLINE: How Americans Are Expanding Their Use Of The Internet," February 2002, National Telecommunications and Information Administration and the Economics and Statistics Administration

Table 1 - An Information Page from CPSC's Web Site with Links to Electrical Documents

Electrical Safety Publications @ www.cpsc.gov			
Document Number	**Name of Publication**	**Document Format**	
016	**Extension Cords Fact Sheet**	HTML	
099	**GFCIs Fact Sheet**	HTML	
513	**Home Electrical Safety Audit Room by Room Checklist**		PDF PDF-Spanish
516	**Repairing Aluminum Wiring** (Booklet)		PDF
518	**Home Wiring Hazards** (Booklet)		PDF
524	**Electrical Receptacle Outlets** (Fact Sheet)	HTML	
5037	**Newer Hairdryers Prevent Electrocutions** (Safety Alert)	HTML	PDF
5038	**Use a Ground-Fault Circuit-Interrupter With Electric Heaters in the Bathroom** (Safety Alert)	HTML	
5039	**Install Ground-Fault Circuit-Interrupter Protection for Pools, Spas and Hot Tubs** (Safety Alert)	HTML	PDF
5040	**Use a Ground-Fault Circuit-Interrupter With Every Power Tool** (Safety Alert)	HTML	
5060	**Metal Ladders and Electricity Don't Mix** (Safety Alert)	HTML	
5061	**Electrocution Hazard with Do-It-Yourself Repairs of Microwave Ovens** (Safety Alert)	HTML	PDF
5133	**Preventing Home Fires: Arc Fault Circuit Interrupters (AFCIs) Describes** a new electrical safety device for homes which is expected to provide enhanced protection from fires resulting from unsafe home wiring conditions.	HTML	
5134	**Arc Fault Circuit Interrupters (AFCIs)** (Fact Sheet)		PDF

From http://www.cpsc.gov/CPSCPUB/PUBS/elec_sfy.html

In addition to direct access to these documents through CPSC's web site, consumers may reach these documents through other web pages. A search of the Internet using the Google (www.google.com) search engine found literally thousands of links to CPSC. Searching on "electrocution CPSC " yielded over 1,400 sites and "electrical shock CPSC" found almost 1,900 sites. Some were links directly to the CPSC web site, but most were to sites run by schools, laboratories, insurance companies, electrical utilities, do-it-yourself groups and independent safety organizations. One notable linkage is to the National Electrical Safety Foundation (www.nesf.org). Now called ESFI to highlight its international focus, the non-profit group was founded by an industry consortium as a result of activities for the annual Electrical Safety Month, which has been jointly sponsored by the CPSC and industry.

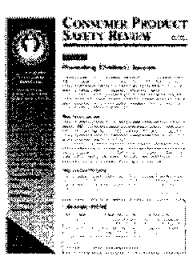
CPSC's toll-free telephone hotline allows consumers to contact the agency with complaints about consumer products and obtain information about specific products and recalls or about general product and household safety. The hotline has the capacity to respond to up to 400,000 calls a year and includes multilingual services. Hotline calls requesting all types of information peaked in 1999 at 411,000 calls. Incoming calls dropped to 200,000 in 2000 and 2001, largely due, we believe, to the substantial user growth at CPSC's web site. Hotline personnel also respond to e-mails addressed to info@cpsc.gov from consumers. These increased from 1,150 in 1997 to more than 9,400 in 2000 and over 12,000 in 2001.

Available hotline literature about electrical safety is summarized in Table 2 below. The "CPSC Guide to Home Wiring Hazards" was among the most requested brochures from the hotline. It discusses electrical safety issues throughout the home and suggests effective solutions for reducing shock and fire hazards. Numbers of publications requested through the hotline are included in the counts in TAB G.

Table 2 - CPSC Electrocution Hazard Publications Available through the Hotline

CPSC Guide To Home Wiring Hazards; Doc. #518; U.S.G.P.O. 1996; 718-282/82650
Extension Cords Fact Sheet, Publication #16; U.S.G.P.O.; 1994; 0-160-702
Safety Tips for Flood Victims; Consumer Product SAFETY ALERT; 009307
Portable Hair Dryers Fact Sheet, Publication #35
Electrical Space Heaters Fact Sheet, Publication #98
GFCIs Fact Sheet, Publication #99; U.S.G.P.O.; 1996; 403-706/39090
Electrical Safety Room by Room Audit Checklist (English)Doc. #513 /
(Spanish) #513S
Electrical Receptacle Outlets; Doc.#524; U.S.G.P.O. 1989; 625-687/10226
Safety for Older Consumers, Home Safety Checklist, Doc.#701

The hotline also provides audio scripts that callers can select using the telephone keypad. A review of current scripts found about 60 that referred to electrocution or shock hazards out of the roughly 500 active recordings. Most of them give recall-specific information to the consumer. The remainder (7 scripts) announce National Electrical Safety Month, the thrift store study, fire safety during the winter holidays that included a mention of shock risk from Christmas lights on a metallic tree, safety tips after a hurricane, and three recall roundups from 1999, 2000, and 2001 that identified old hair dryers as shock hazards.



The Consumer Product Safety Review (CPSR) is published quarterly and provides information to health and safety professionals, as well as to members of the public, who subscribe to it or view it on our Web site. CPSR readers (over 111,000 in 2001) are principally those who visit CPSC's web site, but also include about 600 paid print subscribers. Electrical hazards and preventing electrocution were mentioned in two CPSR articles. One was a 3-page feature article discussing the 1999 "Thrift Store Study" (Vol.4, No.3), which observed

that 20% of surveyed stores sold hair dryers that lacked an immersion protection plug on their cord sets. The Winter 1998 (Vol.2, No.3) issue carries a six-page article on "Preventing Children's Injuries" that has a one-line caution to "use ... safety plugs to cover electrical outlets."

The National Injury Information Clearinghouse provides data to the public on deaths, injuries, and reported incidents associated with consumer products. They provide this data from four major agency databases:

- the National Electronic Injury Surveillance System (NEISS), which is a nationwide sample of hospital emergency departments that report injuries involving consumer products,
- the Death Certificate files (DTHS), which are procured from state health departments when the deaths involve consumer products,
- the In-Depth Investigation files (INDP), which contain detailed incident information collected by CPSC's field investigators, and
- the Injury/Potential Injury Incident files (IPII), which collects hotline reports, letters from consumers, product-related news articles, and medical examiners' reports.

The Clearinghouse staff also notifies manufacturers about potential hazards associated with their products, providing them with consumer complaints, reported incidents, and accident investigations involving their products. Before manufacturers receive a consumer complaint about an unsafe product or incident, Clearinghouse staff sends a copy of the report to the consumer for verification that the report is accurate and complete.

The Clearinghouse responds to about 3,500 request each year. Records were not available that segregate responses to consumers about electrical shock and electrocution hazards.

Tab I

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: July 15, 2002

To: N.J. Scheers, Ph.D., Director
Office of Planning and Evaluation

From: Robert Garrett, Office of Planning and Evaluation RG

Subject: Budget Resources for the Electrocution Program

Starting in 1999 CPSC implemented a revised accounting system to capture the expenditure of staff and contract fund resources directed toward its strategic goals. We also developed our first annual performance plan to define our proposed activities and objectives in terms of strategic goals. Accounting codes for "Electrical Codes and Standards (Electrocution)" captured technical activities devoted to work with UL, NFPA, and other standards organizations. Compliance activities could be segregated into work for "Electrical Hazard Regulation," "Electrical Hazard Section 15," and "Electrocution Hazards." Before these changes, attributing funds and resources to the electrocution goal was extremely difficult from an organizational perspective.

Table 1 on the following page shows staff resources and funds expended to support the activities undertaken by CPSC to reduce electrocution death during the four year span 1998 - 2001. CSPC's Office of the Budget used our revised financial accounting system to provide identifiable data. "Total Direct Costs" represent allocations for the technical (EXHR) and compliance (EXCE) staffs, while "Total Electrocution Program Costs," which were taken from our annual Progress Reports, include additional staff allocations for public affairs and administrative support. No outside contracts or purchases of goods were made to support the program, therefore, all costs were for staff resources

Table 1. Electrocution Program Costs

Costs*	FY1998 Actual		FY1999 Actual		FY2000 Actual		FY2001 Actual	
	FTEs	Total $	FTEs	Total $	FTEs	Total $	FTEs	Total $
EXHR	1.0	99.5	0.7	63.8	1.3	126.2	1.9	219.3
EXCE	10.8	990.3	9.6	884.6	11.0	1,001.0	11.6	1,125.6
Total Direct Costs	11.8	1,089.8	10.3	948.4	12.3	1,127.2	13.5	1,344.9
Total Electrocution Program Costs	22.1	2,167.0	19.6	1,917.0	23	2,293.0	25	2,569.0
Total CPSC Expenditures	462	44,949	466	46,974	468	48,765	469	52,338
Electrocution Program Percent	4.8%	4.8%	4.2%	4.1%	4.9%	4.7%	5.3%	4.9%

*Source: CPSC Office of the Budget
Expenditures are in thousands of dollars
1998 values estimated using the average of the ratios of annual program costs and direct costs
There were no contract monies expended in support of the Electrocution Project over this time period

- EXCE staff resource funds are directed toward conducting Product Safety Assessments (PSAs) of suspect consumer products and preparing corrective actions for those that are found to be substantially hazardous because they present a foreseeable risk of causing shock or electrocution. They are about ten times greater than EXHR funding, because PSAs are labor-intensive tasks that often require careful study and extensive laboratory testing before a determination can be as to how hazardous a product is.

- EXHR staff resource funds are used to study products covered by voluntary standards and to propose improvements to those standards and to the codes that can be used to reinforce them. Typically, these activities benefit from information gathered by conducting PSAs, as well as from laboratory testing and researching technical literature and other reports. Much of the work done by EXHR for this program is to prepare proposals to code and standards committees and to meet with industry and with code and standards groups to discuss and consider the proposals.

- The balance of the reported funding covers administrative, clerical, and support staff (including support for the test laboratory) whose work is shared over numerous programs. In particular these activities include preparing recall and public safety announcements, developing outreach and cooperative programs with other organizations, and developing or maintaining content for the web site.